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INSTRUCTION COURSE

First Day

THURSDAY, September 5, 1935

- 9:00 to 9:45 A.M. An Introduction to Physical Therapy.
DR. FRANZ NAGELSCHMIDT.
- 9:50 to 10:30 A.M. Medical Diathermy — Physics, Indications — Technic.
DR. FRANZ NAGELSCHMIDT.
- 10:35 to 11:15 A.M. Short Wave Diathermy.
DR. DISRAELI KOBAK.
- 11:20 to 12:00 Noon. Diathermy in Rhinology and Laryngology.
DR. JOHN L. MYERS.
- 12:00 to 1:50 P.M. LUNCHEON — Round Table Discussion:
Diathermy —
DR. FRANZ NAGELSCHMIDT.
- Short Wave Therapy —
DR. DISRAELI KOBAK.
- 2:00 to 2:45 P.M. Ultraviolet Irradiation — Physics — Indications — Technic.
DR. FRANZ NAGELSCHMIDT.

- 2:50 to 3:30 P.M. Irradiation of Foods, Drugs and Other Substances.
DR. C. I. REED.
- 3:35 to 4:15 P.M. Physical Therapy in Proctology.
DR. WILBUR E. KEESEY.
- 4:20 to 5:00 P.M. X-Ray and Radium Therapy: Fundamentals, Indications and Methods of Application.
DR. ALBERT F. TYLER.
- 5:05 to 5:45 P.M. Treatment of "Neuralgias".
DR. DISRAELI KOBAK.

Second Day

FRIDAY, September 6, 1935

- 9:00 to 9:45 A.M. Short Wave Diathermy.
DR. FRANZ NAGELSCHMIDT.
- 9:50 to 10:30 A.M. Fever Therapy.
DR. WILLIAM H. SCHMIDT.
- 10:35 to 11:15 A.M. Physical Therapy in Gynecology.
DR. A. DAVID WILLMOTH.
- 11:20 to 12:00 Noon. Colonic Therapy.
DR. JAMES W. WILTSIE.
- 12:00 to 1:50 P.M. LUNCHEON — Round Table Discussion:
Fever Therapy —
DR. WILLIAM H. SCHMIDT.
- Physical Therapy in Gynecology —
DR. A. DAVID WILLMOTH.
- 2:00 to 2:45 P.M. Ultraviolet Irradiation in Relation to Deficiency Diseases.
DR. C. I. REED.
- 2:50 to 3:30 P.M. Physical Therapy and the Internal Secretions.
DR. FRANZ NAGELSCHMIDT.
- 3:35 to 4:15 P.M. Physical Measures in Subdeltoid Bursitis.
DR. NATHAN H. POLMER.
- 4:20 to 5:00 P.M. Physical Therapy in Otolaryngology.
DR. T. S. BLAKESLEY.
- 5:00 to 5:45 P.M. Ionization in Rhinology and Otolaryngology.
DR. A. R. HOLLENDER.

Third Day

SATURDAY, September 7, 1935

- 9:00 to 9:45 A.M. Hydrotherapy and Massage.
DR. JOHN D. CURRENCE.
- 9:50 to 10:30 A.M. Low Voltage Currents; Discussion of Concepts, Units and Energy Transformations.
MR. HOWARD A. CARTER.
- 10:35 to 11:15 A.M. Electrosurgery.
DR. WILLIAM L. CLARK.
- 11:20 to 12:00 Noon. Corrective Exercise and Massage.
DR. F. H. EWERHARDT.
- 12:00 to 1:50 P.M. LUNCHEON — Round Table Discussion. Work of the Council on Physical Therapy, American Medical Association.
DR. JOHN S. COULTER,
MR. HOWARD A. CARTER,
DR. FRANK H. KRUSEN.
- 2:00 to 2:45 P.M. Arthritis.
DR. JOHN S. COULTER.
- 2:50 to 3:30 P.M. Physical Therapy in Urology.
DR. GUSTAV KOLISCHER.
- 3:35 to 4:15 P.M. Short Wave Diathermy.
DR. DAVID H. KLING.
- 4:20 to 5:00 P.M. Infrared and Ultraviolet Irradiation.
DR. A. J. KOTKIS.
- 5:05 to 5:45 P.M. Low Voltage Currents: Clinical Application.
DR. FRANZ NAGELSCHMIDT.

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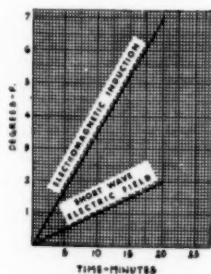
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1934), who concluded after their earlier experiments that the heating characteristics of electromagnetic induction are such as should prove particularly effective in heating also the deep-lying tissues, and that inductothermy therefore provides a means for the more comfortable treatment of patients having an unusually large amount of subcutaneous fat.

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STATUS OF ELECTROSURGICAL PROSTATIC RESECTION *

HARRY C. ROLNICK, M.D.

Michael Reese Hospital

CHICAGO

There has been a decided reduction in the mortality from prostatic surgery since the advent of transurethral resection. We have noted in the urologic service at the Cook County Hospital a lessened mortality as compared with two-stage suprapubic prostatectomy, which was the routine until three to four years ago. Perineal prostatectomy, however, which we are now doing as frequently as resection, shows even a lower mortality. The vast majority of urologists began the routine use of transurethral surgery about four years ago. There were a few men, outstanding among whom is Caulk, who were the pathfinders in this field. Except for these few, none had any previous experience with this procedure, and, as one might have expected, frequently had to learn from their own mistakes. Because of that the early mortality was high, 20 to 40 per cent being reached in some cases. Standardization of technic, proper pre- and postoperative care, and above all, increasing experience, as Alcock⁽¹⁾, has so well emphasized, have reduced the mortality to its present low rate. It is now 2 to 4 or 5 per cent in the hands of urologists who command a large clinical material.

Resection in many cases requires a much larger experience than either suprapubic or perineal prostatectomy. Most urologists consider perineal prostatectomy a difficult procedure, requiring considerable training, hence many have gained only limited experience with it. I find by contrast that resection is very often more difficult than either perineal or suprapubic prostatectomy. I have done approximately 200 resections, and still feel far from secure in my orientation and technic. It is therefore hard to understand why transurethral resections are often left to the youngest member of a urologic group.

When urologists began transurethral resection about four years ago, most were of the opinion that it had relatively little value in prostatic enlargement, and that its use would

be limited to the relief of median bars and bladder neck contractures. The most brilliant results are now had in the presence of bars and contractures, resection in these cases consuming very little time even by men with relatively little experience.

In common with many other conservative urologists we have found that certain types of true prostatic hypertrophy are amenable to transurethral resection, and have come to the conclusion that this procedure has a large place in the treatment of prostatic obstructions. We feel, however, that there still remain a large group of patients with prostatic obstruction who are best treated by perineal or suprapubic prostatectomy. There is a decided difference of opinion between urologists who prefer open operation when they feel it is indicated, and those who resect routinely all patients, irrespective of size, type or location of the enlarged prostate.

The resectoscope has considerably increased our knowledge of the pathologic anatomy and pathologic physiology of prostatic hypertrophy. We have learned that relief by prostatic surgery is due to the removal of the obstruction, and that no mechanism other than that of obstruction plays a large rôle in the production of symptoms. It is therefore necessary to remove enough tissue to allow for a proper channel. This can be accomplished transurethral as well as by suprapubic or perineal prostatectomy.

The urologists who resect routinely, therefore, assume that the method of relief in prostatic obstruction depends upon individual preference of the operator based on his experience with either procedure. We do not dispute that with a large experience, almost any type of prostatic obstruction can be removed successfully by transurethral resection.

It is seriously to be questioned that individual preference should be the deciding factor, for many of the prostates operated transurethral could be more readily and safely removed by the same surgeon by suprapubic or perineal prostatectomy. Large intravesical

* Read at the Mid-Western Sectional meeting of the American Congress of Physical Therapy, Madison, Wisconsin, March 12, 1935.

prostates frequently require a two or three stage resection, with considerable time consumed at each operation, and varying intervals between the procedures. It is in these and other types of hypertrophy that we find that obstruction can be relieved better, quicker and safer by open operation.

There are many factors which complicate the problem. Some patients do not tolerate a urethral catheter. In some cases urethral fever and increased infection contraindicate urethral drainage. Many patients with marked nitrogenous retention do not do well with catheter drainage. All of these require cystotomy as a preliminary step, irrespective of the type of operation proposed. Cystotomy is often a lifesaver, and can be done readily under local anesthesia. With local anesthesia, a minimum of exposure, and a rapid operation, there is practically no mortality, as I have found even when the operative risk was great. I have always considered a cystotomy a "safety valve," for no matter what happens the patient does not "blow up," within himself, and the bladder is always accessible. With a cystotomy most prostates can be removed more readily, and equally as safely by suprapubic enucleation as by transurethral resection.

Bladder calculi associated with a prostatic obstruction can be crushed, and transurethral resection done later. Litholapaxy, which has become almost a lost art, has been revived considerably since the beginning of the resection era. Cystotomy is however, frequently necessary for the removal of stones. Occasionally a stone may be lodged behind the prostate, and may not be visible by x-ray or cystoscopy. In one case, to illustrate, one stone found in the bladder was removed on cystotomy, but another behind the prostate was not discovered until resection was attempted. The stone was too large to be removed through the resectoscope, and suprapubic enucleation of the prostate, together with removal of the stone was necessary. Here again, with a cystotomy it may be seriously questioned whether it is wiser to do a transurethral resection or a prostatectomy.

Bladder diverticula, if of the retention type, must be removed in order to get a result with either resection or prostatectomy. Here also, an open bladder makes prostatectomy a more suitable procedure in most cases.

Perineal prostatectomy is the ideal proce-

dure in the presence of prostatic calculi. Some men have stated that the stones fall out of the prostatic bed into the urethra following resection. I have not found this to be a fact. Intraurethral lateral lobe hypertrophy is best removed perineally. Perineal drainage and prostatectomy are indicated for severe infection of the prostate with frequently associated abscess and breaking down of tissue. I have seen an appreciable number of patients in whom the infection did not subside, as is usual when a cystotomy is done, and in whom perineal drainage became necessary. Occasionally, the prostatic urethra is short, and in the presence of intraurethral lateral lobe hypertrophy the verumontanum may be midway in the line of the obstruction rather than at its usual anterior boundary. Here again perineal prostatectomy is the procedure of choice; in fact, resection here may lead to incontinence because the external sphincter may be damaged in removing the verumontanum and tissue behind it.

I have had two patients with rather large median and lateral lobe hypertrophy, each of whom I resected twice. Considerable tissue was removed each time, and apparently a good channel obtained in each case, but the patients still had practically complete retention. Suprapubic prostatectomy was then done, and the specimens present a point of interest. To put it literally, the floor and the walls had been removed, and then "the roof caved in." In other words, the lateral lobes reached upward and united anteriorly where it is difficult to resect. With the removal of supporting tissue, they fell down, and caused even more obstruction.

Patients who have been resected have a "dirty" urine for a long time. I am impressed with the statement of one urologist that those who have been resected are below par for a long time, as a result of continued infection, whereas the prostatectomized patient feels and looks better within a short period.

When obstruction develops in cancer of the prostate, resection for the establishment of a channel is definitely indicated and has virtually replaced permanent suprapubic cystostomy. But the problem in cancer is larger than that. If it is possible to discover cancer of the prostate early enough, it can be eradicated perineally. Occasionally a biopsy of resected tissue will disclose an unsuspected carcinoma, which can then be attacked perineally,

if it is in an early stage. Whenever carcinoma is suspected, perineal prostatectomy is indicated. If early carcinoma is discovered, a radical perineal prostatectomy can then be done. We have performed 12 radical perineal prostatectomies to date, and have apparent cures, with good functional results in 3 cases.

Conclusion

As urologists, we must be prepared to cope with the various conditions encountered in prostatic surgery. We must, therefore, be prepared to meet the situation by the most

suitable of the methods of approach, and be well oriented in perineal and suprapubic prostatectomy as well as transurethral resection. Approximately 60 per cent of prostates can be safely and satisfactorily resected, but the remainder are better treated by open surgery. We must not let ourselves become "one-track" urologists, and should be prepared to attack each problem by the best available means.

Reference

1. Alcock, N. G.: Prostatic Hypertrophy, J. A. M. A. 104:734 (March 2) 1935.

ELECTROSURGERY IN UROLOGY *

F. G. HARRISON, M.D.

PHILADELPHIA

Electrosurgery combined with modern cystoscopy has raised urology to a comparatively higher therapeutic as well as diagnostic level than was attained by other branches of surgery.

It has been said that the only difference between the general practitioner and the specialist lies in the instruments, and this was never more true than in the present instance where electrosurgery enables the urologist to perform an intraurethral prostatic resection. This is only one of the attainments, and we must review the relation of electrosurgery to urology at some detail.

Chancroid may be successfully treated by fulguration after the method advocated by Robbins and Seabury⁽¹⁾. A 10 to 20 per cent solution of cocaine is applied directly to the ulcer, followed by a liberal application of a 25 per cent solution of cupric sulphate. The monopolar current with the vacuum electrode directs the spark over the lesion with special attention to its undermined edges. A grayish green discoloration covers the ulcer, which in a few days becomes a healthy granulating wound. The treatment may have to be repeated. The current is alleged to drive the copper ions into the tissues, destroying the infection. Where the vacuum electrode is not

available, a round needle electrode may be used. From a host of "cures" as numerous as those for gonorrheal urethritis, we now have at our command one that justifies such a designation.

The larger *verrucae*, the so-called venereal warts, respond readily to the spark from the monopolar current under local anesthesia. The sensitive urethral caruncle in the female may be destroyed in the same manner.

Destruction of *epithelioma of the penis* by fulguration and radium has been advocated by Corbus⁽²⁾, Pfahler and Widemann⁽³⁾ and Kelly and Ward⁽⁴⁾, particularly in the earlier stage limited to the glans or coronal sulcus. Pfahler and Wideman have employed surgical diathermy in amputation of the penis in the more extensive conditions with little hemorrhage and without subsequent stricture of the urethral meatus. Metastatic inguinal lymph nodes are controlled in the same manner following x-ray therapy. Most urologists still rely on the scalpel in the radical operation for carcinoma of the penis and direct attention to prevent meatal stricture.

Stricture of urethra. While the golden urologic rule in the handling of strictures is to dilate when one can and cut if one must, electrosurgery offers a new means in those cases of non-dilatable urethral strictures, where it is possible to pass a filiform bougie. The

* Read at the Thirteenth Annual Session of the American Congress of Physical Therapy, Philadelphia, September 13, 1934.

patient is prepared as for the usual internal urethrotomy, and under caudal or general anesthesia, the filiform guide is passed through the stricture into the bladder. The electrode bougie as adapted by my colleague, Dr. Joseph C. Birdsall, after that described by Sarmiento⁽⁵⁾, of Mexico, is connected by its screw attachment and passed with the filiform as a guide until the stricture obstructs its passage. The current is applied and the stricture bored through or reamed out with little or no hemorrhage. At present there are three different sizes of bougie electrode with metal olives or tips, so that one may electrocoagulate the stricture to the desired size. A retention catheter is tied in according to the technic employed for internal urethrotomy, is removed in several days and followed by the passage of bougies or sounds to insure dilatation. There is not the tendency to contract down following electrocoagulation of a stricture that is experienced with simple divulsion.

Hypertrophy of verumontanum. Congestion of the verumontanum, hyperplasia or tumor are effectively controlled by the coagulating current through the cystoscope. In children with enuresis that does not respond to simple corrective measures and in the absence of any other pathologic lesion outside of an enlarged verumontanum, fulguration through an infant cystoscope often brings about immediate and permanent relief.

Vesical neck obstruction and prostatic hypertrophy. Electrosurgery plays its principal rôle in the relief of obstruction at the vesical neck, a procedure which has aroused great interest. Over a century ago, in 1830, Guthrie⁽⁶⁾ first described the "bar at the neck of the bladder," a condition, the pathology and treatment of which now constitutes one of the most debated questions. He devised an instrument of his own, which with that of Home⁽⁷⁾, Thompson⁽⁸⁾ and Mercier⁽⁹⁾ and others, was called variously the prostatome, the incisor, the excisor, the prostatolithotrite, or the kiotome. As there was no means to control hemorrhage, the method was discarded. In 1874, Bottini⁽¹⁰⁾ introduced his galvanocautery designed to act not merely on the mucous membrane, but to produce thermo-caustic destruction and incision of the enlarged lobe of the prostate. It was revived with the work of Albarran⁽¹¹⁾, who revolutionized the ancient anatomic conception of the obstructing bar. The instrumental era of

endoscopic prostatic resection was inaugurated in America by the so-called punch operation or punch prostatectomy. Young⁽¹²⁾, in 1913, gave the impetus with his punch to the evolution of new instruments with improved visual systems, and to the introduction of the high frequency current which makes it possible to cut the offending tissue and to coagulate in water under direct vision through the sheath of the endoscopic tube without removing the instrument. Young's punch was a "cold" punch which bit a piece of tissue from the vesical neck without visual supervision. Hemorrhage was difficult to control in all cases, so much so, that many urologists were afraid to use it, and it was usual in our clinic to perform a suprapubic cystotomy to have the punch under direct vision so that hemorrhage could be controlled. A spiral electrocautery was introduced to arrest hemorrhage in 1927. Caulk, in 1920, developed a cautery punch whose practicability and efficiency made a widespread impression. In order to burn the tissue properly and prevent hemorrhage, the procedure must be done slowly under low heat. At first there was no visual supervision, but this has been added now. In our clinic, Dr. Jos. C. Birdsall has modified the instrument by enlarging the fenestrum and by employing the cutting current, with satisfactory results. As this procedure may be used under infiltration anesthesia, it is rapid and produces but little hemorrhage, it is our choice for fibrotic bars and vesical contractures, though the author has advocated its use also in prostatic hypertrophy, regardless of size.

Meanwhile, mechanical improvements of the visual system had been made, and McCarthy⁽¹⁴⁾ brought out his panendoscope which permitted larger instruments to be passed through the sheath and a fore oblique lens. The high frequency current in the apparatus has been "stepped up" so that a cutting under water became available and a coagulating current could be obtained without change of instrument. It is essential for electrosurgery to have an instrument capable of providing these conditions.

Braasch⁽¹⁵⁾, Bumpus⁽¹⁶⁾, Collings⁽¹⁷⁾, Stern⁽¹⁸⁾, Davis⁽¹⁹⁾, Day⁽²⁰⁾, Rose⁽²¹⁾, Kirwin⁽²²⁾ and others have contributed instruments which have certain additional advantages. In the Day punch the tissue is electrodesiccated before excision, while the Kir-

win appliance has a rotary motion. Good results are obtained by skilful manipulation of the instrument most familiar to the operator. Under caudal, sacral, spinal or general anesthesia, multiple bites are taken at the obstruction and the hemorrhage is controlled under direct vision. This accomplishment which relieved the patient of a cutting operation and shortened the hospital stay, was received with acclaim. While the method seemed particularly adaptable to fibrotic bars, contractures at the vesical neck, tags following prostatectomy and malignant tumor of the prostate, hypertrophy of the prostate of the median and lateral lobes, have been included. Vesical complications accompanying hypertrophy indicate suprapubic operation. It takes more than the average cystoscopist with improved technic to accomplish the desired result. The patient should be as carefully studied as for the radical operation, but the procedure is not as shocking, so that those patients unsuitable for radical operation safely withstand resection. Again, the patient who refuses to consider a radical operation rarely objects to intraurethral resection. There may be reaction following this procedure out of proportion to the severity of the resection, and there have been complications such as hemorrhage, requiring cystotomy for control, opening of the rectum, and the like. The procedure may have to be repeated to relieve obstruction when sufficient tissue is not removed at the first resection.

The extreme views on resection are those that employ it for all forms of vesical neck obstruction, hypertrophy of prostate, and the like, to those who use it rarely. Young, Squier, Davis propound the question: Why resort to what may be only palliative procedure, when by radical operation the mortality is 3 per cent or less?

Bladder

Beer⁽²³⁾ revolutionized the treatment of benign papilloma of the bladder, when, in 1910, he introduced fulguration through a cystoscope. Previously, the rapid recurrence after surgical removal not only at the original site, but also in the line of the scar, produced so much despair among surgeons that they hesitated to operate. Various types of intraurethral electrodes may be used, the common type being that of Bugbee⁽²⁴⁾, and while the unipolar current was employed in the beginning, the bipolar current with the larger in-

active electrode beneath the buttocks is more effective and generally used. As there is a marked tendency of these tumors to recur, frequent cystoscopic observation after destruction will permit the detection and destruction of any "buds" before they attain any great size. These tumors are potentially malignant and the destruction in the earlier stages lessens the possibility of malignant degeneration. The method is used as a therapeutic test for benignancy as those tumors which do not respond to the current quickly are probably malignant.

Most urologists agree that carcinoma of the bladder is best treated by excision or resection. In the majority of cases, however, the tumor is unfavorably situated, or the disease too far advanced for radical procedure. The destruction of the tumor by surgical diathermy following a suprapubic cystotomy has produced palliative results which in some cases have extended over a five year period. I⁽²⁵⁾ reported the results of that procedure as compared with those of other methods in our clinic, in 1928, and we know of nothing better as a palliative today.

The papillary type of carcinoma responds best. Some urologists, when the entire tumor can be visualized through the cystoscope, destroy this type of tumor by cystoscopic fulguration, but if it is large, it is best attacked through a cystotomy. The large inactive electrode is placed beneath the buttocks, and using one of the various types of interchangeable electrodes or tips, depending upon the size and position of the tumor, a strong coagulating current is used. The coagulated tumor may be curetted away, and the destruction of the tumor is carried beyond the base, when possible. The use of radium following such a procedure is a matter of personal choice, many advocating it, but it has not been effective in our hands.

Prostate

Carcinoma of the prostate may be attacked in the same manner as a palliative procedure. It may be accomplished by cystoscopic destruction of the obstruction or by suprapubic and perineal exposure. The results are bad and radium has been more effective in these cases.

The cure of chronic prostatitis is long drawn out and particularly difficult to accomplish in some cases. While medical diathermy is the treatment of choice in acute prosta-

titis unattended by suppuration, in chronic prostatitis medical diathermy has not produced nearly as brilliant results, so that digital prostatic massage is still generally employed. Thompson⁽²⁶⁾ has advocated the treatment of various prostatic and posterior urethral lesions by electrocoagulation or incision with electrocautery, and with Cook⁽²⁷⁾ has reported a series of cases. Removal of prostatic calculi by transurethral methods has been recorded by Michel⁽²⁸⁾ and incision of large subacute abscesses of the prostate by Multhau and Curtis⁽²⁹⁾. Heitz-Boyer⁽³⁰⁾ states that as early as 1920, he was opening by various intra-urethral methods prostatic and urethral diverticulae, which he often found in patients with chronic prostatitis of many years' duration.

Kidney and Ureter

As a polycystic kidney is a congenital, bilateral condition, hemorrhage or other symptoms which demand surgical intervention are to be managed by the method described by Rovsing⁽³¹⁾, that is to open and destroy the multiple cysts by electrocautery. Electrosurgery in the form of the "radio knife" has been employed instead of the scalpel.

With the smallest diameter of the ureter at the uretero-vesical meatus, many small renal calculi in transit become lodged there. Their passage may be hastened if the ureteral orifice be enlarged. While this may be accomplished satisfactorily by cutting the orifice with cystoscopic scissors, severe hemorrhage may occur, requiring cystotomy for control. The enlargement of the orifice may be accomplished by cystoscopic fulguration with a specially designed meatal electrode. It is inserted so that the active portion comes in contact with the orifice at about 12 o'clock and using a bipolar current, the opening is enlarged to the desired size.

Conclusion

It is seen in this era of scientific progress, that a place in the practice of urology must deservedly be awarded to electrosurgery as having revolutionized surgical urology. It is significant that in the poll for outstanding contributions in urology conducted by Caulk in the American Urological Association, electrosurgery was awarded 2nd and 5th positions.

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IMMUNOLOGIC STUDIES IN HYPERPYREXIA *

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Few immunologic studies have been made of patients treated with hyperpyrexia. Most workers have limited their investigations to chemical changes and have fairly well established that any alterations in the blood of patients undergoing hyperthermia are slight and transient.

Feinberg, Osborne and Afremow⁽¹⁾ noted a moderate increase (about ten per cent) in the erythrocyte count of asthmatic patients during the diathermy fever. They concluded, as did Mortimer⁽²⁾ that this was a blood concentration effect. The leucocyte count, however, in most cases showed a definite increase, sometimes as much as 100 per cent. There was also a slight tendency towards acidosis. On the theory that allergy is a state of potential alkalosis they alkalinized a group of patients, but found that in spite of, alkalization diathermy still caused improvement. In five patients with positive skin tests intradermal injections with dilutions of the allergens showed no appreciable change after treatment. Quantitative determinations of the atopic reagents in these patients before, during and after diathermy treatment revealed no decided variations. Their experiments led them to believe that the mechanism producing relief from asthma after hyperpyrexia in-

volves a change neither in the acid-base balance of the blood nor in the skin sensitiveness of the patient to the allergen.

Paretic patients receiving eight to twelve treatments were observed daily during treatment and at intervals for a month after treatment by King and Cocke.⁽³⁾ They reported no changes in erythrocyte or leucocyte counts. Since they did not test the blood at the height of temperature they missed the changes found by Feinberg and Osborne.

The blood picture in 97 paretics, each receiving a course of twelve treatments, one every other day, was negative according to Wilgus and Lurie.⁽⁴⁾ The Wassermann reaction was not once altered. Frequently there was an immediate flattening of the Lange colloidal gold curve. Cell counts of the spinal fluid indicated marked improvement. Globulin was reduced in many cases.

Tenney⁽⁵⁾ made a study of blood chemistry changes, clotting factors, blood counts, viscosity and blood sedimentation rates of individuals in whom an artificial fever was produced by radio frequency current. The chemical changes were of small importance. There was a slight increase in the red blood cell count, due, the author suggested, to dehydration and also to stimulation of the blood forming organs, as shown by the younger forms of erythrocytes. An increase in the total leucocyte count was observed, the maximum in-

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crease occurring nine hours after treatment, with a return to normal in 20 hours. The blood viscosity was not increased during the height of temperature where loss of body fluid was replaced by a large fluid intake. There was a definite increase in the platelet count.

Carpenter and Page⁽⁶⁾ stated that with heat the rate of chemical reactions concerned with the development of immunity and with the general defense mechanism of the body against infective agents increases.

Many of the experiments dealing with the effect of artificial fever in animals have been in rabbits in which experimental syphilis has been produced.

Schamberg and Rule⁽⁷⁾ tested the effect of hyperpyrexia in rabbit syphilis. They were able to sterilize the infection after about nine hot water baths lasting 15 to 20 minutes each. There was an average rise of 4 degrees C. in the animal's temperature after immersion in a bath of 45 degrees C.

Out of 25 rabbits infected intratesticularly with *Treponema pallidum* and treated by radio frequency waves, Carpenter and Boak⁽⁸⁾ reported 21 as failing to develop chancres when treatments were begun, four, five and seven days after injection. Five of these 21 developed nodules but the lesions disappeared when the exposure was intensified. One treated rabbit developed a chancre, while the testes of a second became enlarged, edematous and indurated. On further treatment they became normal. One rabbit died from overheating and one from an intercurrent infection. Eighteen control rabbits infected in a similar manner developed the typical lesions of experimental syphilis.

Hicks and Szymanowski⁽⁹⁾ studied the effects of the high frequency current on the precipitin titer in rabbits. No change was observed after six hours exposure. No beneficial effects were observed on the course of pneumococcus and streptococcus infections in guinea pigs and mice.

In five rabbits immunized to *Bacillus typhosus* and subjected to hyperpyrexia (temperatures from 40.5 to 43.1 degrees C.) Ecker and O'Neal⁽¹⁰⁾ observed a depression of agglutinins during the time of fever but the antibody titer soon returned to normal. Nine normal guinea pigs in which temperatures from 40 to 42.8 degrees C. were obtained showed a decrease in complement in all dur-

ing the first heating. Subsequent heatings either decreased it or increased it. In any case the complement was not completely destroyed.

Reimann⁽¹¹⁾ reviewed the literature on hyperpyrexia and reported experiments in which he showed that the increased viscosity of the plasma, due to increase of certain plasma proteins, which occurs during febrile infection, enhanced the specific agglutinative power of immune serum. This increase in agglutinative power caused by augmentation of viscosity he thought might be an important factor in the defense mechanism against infection. From his own experiments and those of other investigators he concluded that the fever induced by diathermy was not effective in causing an increase in either globulin or fibrinogen which would be marked enough to change the viscosity of the plasma. By varying the viscosity of immune serum by the addition of acacia he was able to show a much greater clumping of bacteria than when immune serum alone was used. It is uncertain whether fever in itself causes protein changes sufficient in amount to produce such changes in viscosity. It probably needs the stimulation or irritation of the globulin or fibronogen forming organs.

Experiments

The method used in producing artificial fever in these cases is that reported by Neymann and Osborne⁽¹²⁾ and consists briefly in the conduction of high frequency currents through the body of the patient by means of special large electrodes, the source of the current being a low voltage high frequency apparatus.

A total of 378 determinations were made on 17 patients. These included nine cases of intractable asthma, seven of infectious arthritis and one of general paresis. Below is listed the number of tests of each type which were performed.

	No. of Determinations	No. of Cases
Total leucocyte counts.....	46	8
Erythrocyte counts	38	8
Differential leucocyte counts	46	8
Complement titer	58	13
Opsonic index	84	17
Phagocytic power of leucocytes	29	4
Agglutination	77	4

Collection of materials for testing:

Blood was drawn into a syringe from the arm vein under sterile conditions. One part

of the blood was discharged into a tube containing heparin or sodium citrate solution, and the rest into a dry sterile tube. For the blood count the ear or finger was pricked and the white and red cell counts and differential counts made in the usual way.

Methods

Complement. The amount of complement present in the human serum was determined by first removing the native hemolytic amboceptor for sheep erythrocytes. This was done by incubating the serum with sheep's washed red blood cells at 2 degrees C. for one hour. The tube containing the serum and cells was then put into a centrifuge tube containing cracked ice and the mixture centrifuged about two minutes to throw down the red cells. Since complement does not act at this low temperature none of it was used

up in the process of removing native hemolysins. The removal of the amboceptor, however, was found not to have any significant influence on the results. The serum was then diluted one to three, and amounts varying from 0.01 to 0.04 were put into small tubes by means of a 0.1 cc. pipette graduated in hundredths. To this were added 0.1 cc. of antisheep amboceptor, diluted 1:250, and 1 cc. of a one per cent suspension of sheep's washed red blood cells. Enough saline was then added to each tube to make the whole volume 2 cc. The tubes were incubated for 30 minutes in a 37 degree C. water bath. Readings were made at the end of that time and also after 18 to 24 hours in the icebox. Only the smallest amount of serum showing complete hemolysis is reported in the tables.

Opsonic index. The ordinary method for

TABLE 1.—*Immunologic Effects of Diathermy in Asthma*

Case No.	Opsonic Index	Complement*	Rectal Temperature
1 First treatment			
Before	1.0	0.20	101.8
Height of temp.	1.2	0.20	104.6
2 First treatment			
Before	1.0	0.40**	102.0
Height of temp.	1.0	0.40	105.4
5 days after first treatment	1.0	0.35	
3 days after second treatment	1.0	0.35	
3 First treatment			
Before	1.0	0.20	99.7
Height of temp.	1.0	0.20	104.8
19 days after first treatment	1.0	0.15	
Third treatment			
Height of temp.	1.2	0.20	104.7
24 hrs. after	1.6	0.20	
Fourth treatment			
Before	1.0	0.15	99.1
4 Second treatment			
Before	0.8		100.2
Height of temp.	Sample lost		103.1
2 hrs. after	0.9	0.10	102.6
5 First treatment			
Before	1.2	0.25	100.2
24 hrs. after	1.2	0.20	Temp. at height was 105.1
Second treatment			
Before	1.1	0.20	99.6
24 hrs. after	1.1	0.20	Temp. at height was 102.1
6 First treatment			
Before	1.0	0.25(3+)	100.5
24 hrs. after	1.0	0.25(3+)	Temp. at height was 103.6
Second treatment			
Before	1.1	0.20	100.4
Not possible to get sample after treatment			
7 First treatment			
Before	1.0	0.20	100.2
24 hrs. after	0.8	0.20	Temp. at height was 103.7
8 First treatment			
Before	0.8	0.15	101.4
Height of temp.	0.8	0.20	104.5
Second treatment			
Before	1.1	0.15	99.9
Height of temp.	0.8		103.6
24 hrs. after	1.3	0.15	
9 First treatment			
Before	1.4	0.15	100.3
Height of temp.	0.7	0.15	104.1
24 hrs. after	0.9		

* Serum diluted 1:3.

** Serum diluted 1:5.

TABLE 2. — Immunologic Effects of Diathermy in Arthritis and General Paresis

Case No.	Opsonic Index	Complement	Red Cell Count in Millions	White Cell Count	*** Polys.	L.	E.	Tr.	M.	B.
10 First treatment										
Before	1.0	.....	.....	5800	54	44	1	1	0	0
Height of temp.	1.2	0.10	.....	9700	79	18	2	1	0	0
24 hrs. after	0.9	0.30	.....	9300	78	18	1	2	1	0
Fourth treatment										
Before	0.8	0.30	3.5	5200	63	35	1	0	0	1
Height of temp.	0.8	0.30	4.5	14000	72	26	0	0	1	1
24 hrs. after	0.6	0.30	4.8	7400	60	38	2	0	0	0
Eighth treatment										
Before	1.0	0.4(3+)	4.0	5400	56	42	1	1	0	0
Height of temp.	0.9	0.4(3+)	4.7	17100	78	20	0	2	0	0
24 hrs. after	0.7	0.4	5.1	5700	62	37	1	0	0	0
11 Fourth treatment										
Before	1.0	0.30	4.3	8700	73	25	0	1	1	0
Height of temp.	1.6	0.30	5.9	12800	71	28	0	1	0	0
24 hrs. after	1.0	0.30	6.4	9300	60	36	2	2	0	0
Sixth treatment										
Before	0.9	0.30	4.3	8900	55	27	5	1	2	0
Height of temp.	0.9	0.40	4.9	12200	71	28	0	0	1	0
24 hrs. after	1.0	0.30	5.0	7400	65	33	1	0	1	0
Eighth treatment										
Before	0.9	0.30	5.1	9400	60	38	2	0	0	0
Height of temp.	1.7	0.30	.....	12000	65	32	1	2	0	0
24 hrs. after	1.1	0.30	5.7	9200	47	48	3	2	0	0
12 First treatment	*									
Before	2.1	0.30	4.3	8000	42	56	0	2	0	0
Height of temp.	2.1	0.30	4.8	8100	73	25	0	2	0	0
24 hrs. after	3.5	0.30	4.6	6800	43	54	1	1	0	0
13 First treatment										
Before	0.7	.....	5.7	8500	51	47	1	1	0	0
Height of temp.	1.2	.....	5.6	15900	67	32	1	0	0	0
24 hrs. after	1.0	.....	6.3	14000	63	36	1	0	0	0
Fourth treatment										
Before	0.7	.....	6.4	8800	54	42	0	3	1	0
Height of temp.	0.8	.....	5.5	12900	83	16	0	1	0	0
24 hrs. after	1.0	.....	4.9	8000	63	35	1	1	0	0
Sixth treatment										
Before	1.0	.....	5.3	7500	57	41	0	1	1	0
Height of temp.	1.4	.....	.....	.....	.....	.....	.....	.....	.....	.....
24 hrs. after	1.0	.....	.....	11100	70	26	0	4	0	0
Eighth treatment										
Before	0.9	.....	5.6	8500	55	45	0	0	0	0
Height of temp.	0.8	.....	5.4	11600	69	26	0	3	0	0
24 hrs. after	0.9	.....	5.3	7000	60	40	0	0	0	0
14 First treatment										
Before	1.4	.....	5.3	6800	62	35	0	3	0	0
Height of temp.	1.2	.....	5.9	15400	79	21	0	0	0	0
24 hrs. after	1.2	.....	6.3	7100	57	40	1	2	0	0
15 Second treatment										
Before	1.0	.....	.....	.....	.....	.....	.....	.....	.....	.....
Height of temp.	0.9	.....	.....	.....	.....	.....	.....	.....	.....	.....
24 hrs. after	0.7	.....	.....	.....	.....	.....	.....	.....	.....	.....
16 First treatment										
Before	0.9	.....	.....	.....	.....	.....	.....	.....	.....	.....
Height of temp.	0.9	.....	.....	.....	.....	.....	.....	.....	.....	.....
24 hrs. after	0.9	.....	.....	.....	.....	.....	.....	.....	.....	.....
17** First treatment										
Before	1.5	0.25	.....	9200	49	50	0	1	0	0
Height of temp.	1.7	0.25	4.9	6300	74	26	0	0	0	0
24 hrs. after	1.2	0.25	4.3	6900	48	47	1	3	1	0
Second treatment										
Before	1.1	0.30	.....	5600	47	44	2	4	3	0
Height of temp.	1.0	0.30	4.8	9900	60	37	0	1	1	1
Sixth treatment										
Before	0.9	0.30	4.7	8900	31	65	3	1	0	0
Height of temp.	0.8	0.30	5.1	13000	53	45	2	0	0	0
24 hrs. after	0.8	.....	.....	8100	33	62	3	1	0	0
Eighth treatment										
Before	1.1	0.30	4.3	7700	49	46	1	4	0	0
Height of temp.	1.0	0.30	4.5	9700	60	37	1	2	0	0
24 hrs. after	1.2	0.30	4.6	7400	59	42	3	1	0	0

* The percentage phagocytosis of the control serum and cells was unusually low. This may account for the apparently high values in Case 12.

** Case 17 — General Paresis.

*** Poly. = Polymorphonuclear neutrophils.

L. = Lymphocytes.

E. = Eosinophiles.

Tr. = Transitionals.

M. = Mononuclears.

B. = Basophiles.

performing the opsonic test by dividing the percentage of phagocytosis occurring with patient's serum by that with normal human serum was used in the asthma cases.⁽¹³⁾ In the arthritis and general paresis patients, in addition, the opsonins and phagocytic power of the patient's leucocytes were evaluated as described in a previous paper.⁽¹⁴⁾

Agglutination. Agglutination tests were done by the usual macroscopic dilution method.

Results

Intractable Asthma (Cases 1 to 9 inclusive). No consistent changes in complement titer or opsonic index were observed. What slight changes did occur cannot therefore be attributed to the effects of the temperature. (Table 1.)

Infectious Arthritis (Cases 10 to 16 inclusive) and *general paresis* (Case 17). In 13 out of 15 determinations made at the height of temperature there was an increase in the total number of leucocytes (Table 2). In only one instance did this leucocytosis last 24 hours. The increase was found to be in the number of polymorphonuclear neutrophils.

The percentage of lymphocytes decreased correspondingly. It has been suggested that the concentration of the blood might be the real cause. Since the erythrocyte count did not increase in proportion to the count of leucocytes, which was sometimes 100 per cent, and in view of the disproportionate change in the two types of white cells this is unlikely. In only 5 out of 35 tests was there even a slight increase in the opsonic index.

In examining the phagocytic property of a patient's leucocytes it is not compulsory that their number be constant because variations can be adjusted but the serum should be uniform throughout. This was possible in only three instances, 13 (8), 15 (2) and 16 (1), for these were the only ones tested with normal as well as with their own serum. Since however, diathermy effected little, if any, change in the opsonins and, further, since the phagocytic power was ascertained in these cases (13, 14, 15, 16) both before and after treatment, the findings should be significant. The results are shown in Charts 1 and 2. It is readily seen that diathermy had no effect on the phagocytic property of the leucocytes. It is also apparent that when counts above

TABLE 3.—*Agglutination with Typhoid Vaccine Used in Treatment*

Treatment No.	Case 10						Case 11						Case 13						Case 14					
	10	20	40	80	160	320	10	20	40	80	160	320	10	20	40	80	160	320	10	20	40	80	160	320
I	B	—	—	—	—	—	I	+	+	+	+	—	I	—	—	—	—	—	I	—	—	—	—	—
	Ht	—	—	—	—	—		+	+	+	+	+		—	—	—	—	—		—	—	—	—	—
	A	—	—	—	—	—		+	+	+	+	+		—	—	—	—	—		—	—	—	—	—
IV	B	—	—	—	—	—	VI	+	+	+	+	+	VI	—	—	—	—	—		—	—	—	—	—
	Ht	—	—	—	—	—		+	+	+	+	+		—	—	—	—	—		—	—	—	—	—
	A	—	—	—	—	—		+	+	+	+	+		—	—	—	—	—		—	—	—	—	—
VIII	B	—	—	—	—	—		+	+	+	+	+		—	—	—	—	—		—	—	—	—	—
	Ht	—	—	—	—	—		+	+	+	+	+		+	+	—	—	—		+	+	—	—	—
	A	—	—	—	—	—		+	+	+	+	+		+	+	—	—	—		+	+	—	—	—

B = Before treatment.
Ht = Height of temperature.
A = 24 hours after treatment.

TABLE 4.—*Agglutination with Bacillus Typhosus (Living Stock Strain)*

Treatment No.	Case 10						Case 11						Case 13						Case 14					
	10	20	40	80	160	320	10	20	40	80	160	320	10	20	40	80	160	320	10	20	40	80	160	320
I	B	—	—	—	—	—	I	—	—	—	—	—	I	—	—	—	—	—	I	—	—	—	—	—
	Ht	—	—	—	—	—		—	—	—	—	—		—	—	—	—	—		—	—	—	—	—
	A	—	—	—	—	—		—	—	—	—	—		—	—	—	—	—		—	—	—	—	—
IV	B	—	—	—	—	—	VI	—	—	—	—	—	VI	—	—	—	—	—		—	—	—	—	—
	Ht	—	—	—	—	—		—	—	—	—	—		—	—	—	—	—		—	—	—	—	—
	A	—	—	—	—	—		—	—	—	—	—		—	—	—	—	—		—	—	—	—	—
VIII	B	—	—	—	—	—	VIII	—	—	—	—	—	VI	+	+	+	—	—		+	+	+	—	—
	Ht	—	—	—	—	—		—	—	—	—	—		+	+	+	—	—		+	+	+	—	—
	A	—	—	—	—	—		—	—	—	—	—	VIII	+	+	+	+	—		+	+	+	—	—

15,000 are used, the relation of the number of leucocytes to the percentage phagocytosis is no longer linear. (Chart 2.) This is in agreement with findings in experiments made with normal dog leucocytes.⁽¹⁵⁾

The figures for cases 13 (8), 15 (2) and 16 (1), in which we were able to study not only the phagocytic power of the patients' serum and cells but also the patients' cells with normal serum, indicate no noteworthy

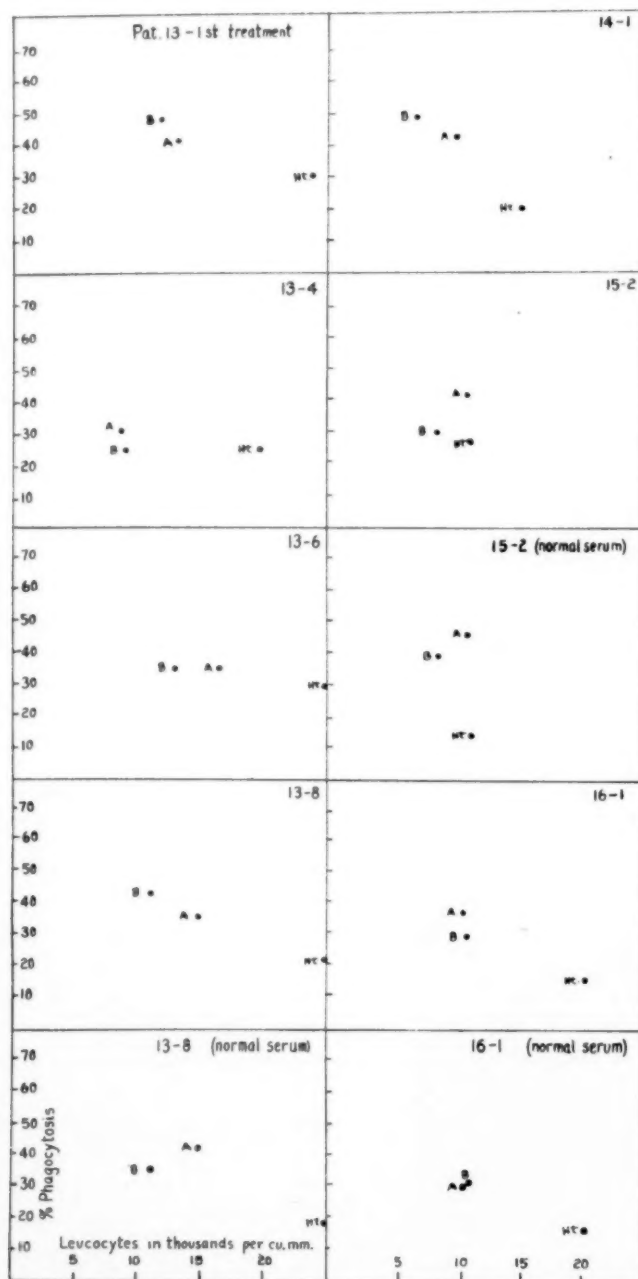


Chart 1. — Effect of Diathermy on Phagocytic Property of Patient's Blood. Case 13 (1st, 4th, 6th, 8th treatments); Case 14 (1st); Case 15 (2nd); Case 16 (1st) — Patient's serum and leucocytes. Case 13 (8th); Case 15 (2nd); Case 16 (1st) — Leucocytes also tested with normal serum.

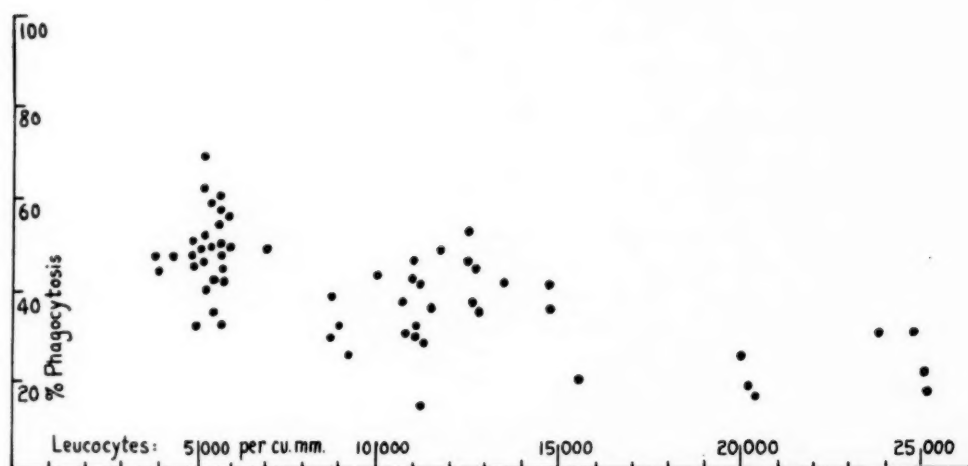


Chart 2. — Effect of Diathermy on Phagocytic Property of Patient's Blood which includes figures from Chart 1 and also figures showing percentage of phagocytosis by normal leucocytes and patient's serum.

differences whether normal or patient's serum was used. There is a suggestion of a change at the height of temperature in the phagocytic power of the leucocytes of patient 15 which is apparent with normal serum but not with the serum of the patient. The increase in the number of leucocytes in this case was slight. Cases 13 and 16 showed no marked differences when patient's or normal serum was used with the patient's leucocytes. A large series of cases treated in this manner might show significant variations.

Since the arthritis patients had received injections of typhoid vaccine for varying

lengths of time preceding their diathermy treatments, it was thought that there might be some changes in the agglutinins for *Bacillus typhosus* and perhaps for organisms in closely related groups. The sera of four patients (Cases 10, 11, 13, 14) were tested with the commercial vaccine used in their treatment. In addition the sera of all four were tried with a living laboratory strain of *Bacillus typhosus*, (Table 4) and cases 13 and 14 also with laboratory cultures of *Bacillus paratyphosus* A and B and *Bacillus coli* (Table 5).

Only one of the four (Case 11) showed any

TABLE 5. — Agglutination with *Bacillus Paratyphosus* A, *Bacillus Paratyphosus* B and *Bacillus Coli* (Living Stock Strains)

Case 13

Treat- ment No.		B. paratyphosus A						B. paratyphosus B						B. coli					
		10	20	40	80	160	.320	10	20	40	80	160	320	10	20	40	80	160	320
I	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Ht	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
IV	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Ht	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
VI	A	—	—	—	—	—	—	+	+	+	+	+	—	+	+	+	—	—	—
	B	—	—	—	—	—	—	+	+	+	+	+	—	+	+	+	—	—	—
VIII	A	—	—	—	—	—	—	+	+	+	+	+	—	+	+	+	—	—	—
	B	—	—	—	—	—	—	+	+	+	+	+	—	+	+	+	—	—	—
	Ht	+	+	—	—	—	—	+	+	+	+	+	—	+	+	+	—	—	—
	A	+	—	—	—	—	—	+	+	+	+	—	—	+	+	+	+	—	—
Case 14																			
I	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Ht	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	A	—	—	—	—	—	—	+	+	+	—	—	—	—	—	—	—	—	—

Controls negative in NaCl.

appreciable amount of agglutinins for the commercial vaccine (Table 3). There was a slight suggestion of an increase in agglutinins in patient 13 (Tables 3, 4 and 5). This was a gradual augmentation which occurred with succeeding treatments but at no time became at all marked. The greatest change took place in agglutinins for *Bacillus paratyphosus* B, with *Bacillus coli* ranking next.

Summary

The only significant immunologic change produced by diathermy in the blood of individuals suffering from intractable asthma, infectious arthritis, and general paresis was a temporary increase in the leucocyte count immediately after hyperpyrexia. This increase was in the polymorphonuclear neutrophils. In all but one out of fifteen determinations the count was normal in 24 hours. The erythrocyte count showed no notable changes. Alterations in complement content, opsonins and phagocytic property of leucocytes were found to be virtually within the limits of normal variation as established by the methods employed. There was an indication of a slight increase in agglutinins with succeeding treatments.

Conclusion

Whatever beneficial effects hyperpyrexia has in intractable asthma, general paresis and infectious arthritis are probably on a basis other than that of the phenomena studied.

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NASAL IONIZATION BY A NEW SIMPLIFIED TECHNIC

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Publications of the past few years on nasal ionization have created an increased interest in this therapeutic method but they have not afforded a correct appreciation of the fundamentals especially as regards the technic. Certain arguments have been advanced in favor of special electrolytes, the necessity of measuring ohmic resistance, and the merits of special apparatus, all of which have contributed to an improper evaluation of ionization which in reality is a simple procedure.

Physical and Chemical Nature of Ionization

In the ionization process as employed therapeutically the galvanic current passes through an electrolyte from one pole to the other. This implies any galvanic current and a solution or preparation in any form capable of conducting it. As is well known, ordinary dry or wet cells or batteries supply a galvanic current suitable for medical purposes. Modern apparatus in the form of generator sets are also available for galvanotherapy. These are energized by the lighting mains, the current being modified so that it is suitable for therapeutic purposes. By means of a rheostat and a meter it can be measured and controlled within limits of safety.

From a chemical point of view an electrolyte is a solution of a salt in water which permits the passage of a galvanic current. The salt molecule is dissociated into its two component parts, each of which carries a positive or negative electrical charge to its respective pole. The electrically charged parts of the molecule are called ions, and the migration of the ions to the two poles, ionization. Eventually, all the molecules of the salt are utilized and ionization ceases unless more molecules are added to the solution.

The ions deposited at the poles lose their electrical charge and become chemical elements which enter into the formation of new chemical compounds, acid at the positive pole, and alkaline at the negative pole. In other words the end result of ionization is a chemical change at the poles affecting organic substances as well as inorganic ones. The physiological effects of ionization therefore are es-

entially the result of the chemical products deposited on the tissues and the biochemical changes which their presence precipitates. While some workers have tried to prove that the ions are driven into the tissues by the current, others have shown by various means that the migration below the surface can be effected only with great difficulty if at all.

Eight patients with hyperesthetic rhinitis were treated by placing the positive electrode on the outside of the nose instead of in contact with the nasal mucous membranes. On six others, the electrodes were placed on different parts of the body. The results were negative so far as changes in the nasal symptoms were concerned. If, as has been claimed, the passage of the current itself possesses therapeutic value in nasal allergies, some improvement should have been noted. It is obvious that from a practical point of view, this discussion can be disregarded if the chemical action of ionization is understood and accepted.

For many years, trichloroacetic acid and phenol have been used in the nose in the treatment of hyperesthetic rhinitis and seasonal hay fever. Cazenave⁽¹⁾ as early as 1837 reported favorable results with chemical cauterization, while only recently Palmer⁽²⁾ reported experiences with phenol and by means of photomicrographs demonstrated his reasons for the improvement obtained in 30 cases of hyperesthetic rhinitis with this treatment. In nasal ionization, the positive or acid pole is used, producing chiefly a chemical effect on the mucous membrane similar to that of escharotics. The ease and safety with which ionization can be applied are decided advantages which render this procedure preferable to cauterization.

Warwick⁽³⁾ has raised some questions concerning the resistance of the skin and the nasal mucosa. While it is true that a resistance averaging 5,000 ohms is measurable before the treatment is started, the resistance drops under all conditions down to a negligible amount after the current has been turned on to a small milliamperage for a very few minutes.

It has been stated also that a special ripple must exist in the galvanic current in order to obtain maximum effects in the treatment of allergic rhinitis. This does not appear tenable because first, the effect desired is primarily a chemical one, and secondly, we have observed results, both good and bad, produced by all types of apparatus supplying galvanic current.

Clinical Effects

The clinical effects of ionization are more or less constant. During the treatment the patient has a metallic taste in the mouth, a sense of fullness, and sometimes pain over the side of the face and head. These symptoms are nearly always easily supported. For a day following the treatment there is a stuffiness of the nose with or without sneezing and secretion and occasionally some headache. More noteworthy is the sense of nausea and systemic discomfort which may occur in this time, and which, in my opinion, is in proportion to the severity of the original symptoms and the immediate tolerance of the treatment. In every case in which symptoms of discomfort have occurred they have been transitory, responding to simple remedies.

Examination of the nose during this period shows the nasal mucosa swollen and covered with a coagulum varying in amount from a very thin to a thick layer. After a time the coagulum disappears, the mucosa becomes clean, taut, free from exudate or excess secretion and normal pink in color. The characteristic edema and pallor of hyperesthetic rhinitis present before ionization is no longer visible and the patient becomes conscious of an improvement in breathing. There then develops a feeling of dryness, which, however, is only temporary.

Subsequently no other symptoms are experienced by the patient or changes observed by the rhinologist, and in favorable cases this state continues for from two to twelve months, and in some instances for several years.

Histologic Observations

Immediately following ionization the mucosa shows a destruction of the surface epithelium almost down to the basement membrane. During the ensuing three months, there occurs an infiltration chiefly of small lymphocytes, with a general increase in the density of the submucosal supportive tissues. In the majority of sections one observes prog-

ress to a condition not unlike that of a true fibrosis.

While there is eventual regeneration of the destroyed epithelium, in a study of a large number of sections I have failed to observe a regeneration of *ciliated* epithelium even in the mucosa of patients removed ten years after ionization.

Few if any changes occur in the mucous glands.

Indications and Contraindications

It may be generally stated that zinc ionization of the nose is indicated whenever increased breathing space is necessary, and when surgical interference is undesirable.

The following conditions come within the scope of these indications:

1. Intumescent rhinitis.
2. Chronic rhinitis.
3. "Hyperesthetic" rhinitis.
4. "Hay fever."
5. Asthma.

Insofar as the contraindications for nasal ionization are concerned it should be emphasized that the procedure is not a substitute for surgery. It is of no value in reducing septal hypertrophies while in acute infections it should be applied with caution. While some favorable reports are on record of its use in acute conditions, sufficient data have not been accumulated to draw definite conclusions.

For the treatment of *intumescent rhinitis*, every rhinologist has his favorite therapy. Various forms of cautery, especially the galvanic, have afforded relief to numerous patients. While this is not an undesirable treatment, it is common experience that many patients are not at all benefited, probably because of obscure etiological factors uninfluenced by local measures. The diagnosis, too, is often not definite and may be confused with either other local nasal diseases or systemic conditions with nasal manifestations.

In a series of patients with *intumescent rhinitis*, one side was treated with the galvanic cautery and the other with zinc ionization. Some patients were treated entirely with the cautery and others with ionization. All patients reported improvement irrespective of the type of treatment. The question arose which treatment possesses greater merit from the standpoint other than that of clinical results. With zinc ionization there is a distinct absence of crusting after the treatment. This is not so with the cautery which also has the

disadvantage of frequently producing synechiae, open, slow healing abrasions and a protracted convalescent period. All these symptoms are avoided with ionization. After a brief period during which only a mild reaction occurs, no further local treatment is necessary.

Chronic Rhinitis

As a palliative measure in the treatment of chronic rhinitis and as an adjunct to other necessary therapy, zinc ionization is superior to most other methods.

Since patients with chronic rhinitis have frequently also a chronic sinusitis, the treatment of the latter should be the first consideration. The chief complaint is that of persistent nasal discharge not only before, but also after nasal or sinus surgery has been performed. Headache, feeling of fullness, obstruction to breathing are other common symptoms. Zinc ionization usually relieves these symptoms for shorter or longer periods. While a single treatment may suffice, it may be necessary to try a second or even a third application. This is especially the case where conservative management must be persisted in as Smith⁽⁴⁾ not so long ago pointed out. In this connection the following case report is of interest.

Mrs. S., age 42, was operated on in 1928 for a chronic ethmoiditis, sphenoiditis, and antritis on the left side. She was seen in 1931 with a persistent profuse discharge from the left side of the nose. There was also a constant feeling of fullness. Acute exacerbations simulating colds were distressing. A single treatment with zinc ionization gave relief for 9 months at which time a second treatment produced freedom from symptoms for two years.

Hyperesthetic Rhinitis

While nasal ionization has been employed extensively in simple chronic rhinitis for a long time, its wider application in hyperesthetic rhinitis is only of recent experience. It should be emphasized that ionization is not the treatment *per se* in allergic nasal conditions. Diet, hygiene and habits, allergic sensitivity, glandular deficiencies, the general health of the individual, sinus disease, and other local and systemic affections require the attention of the physician before any local measures are considered. Patients properly selected for ionization will report marked relief from sneezing, rhinorrhea and obstructed breathing, in from three to seven days. Only one side of the nose should be treated at a

sitting. This obviates most of the after discomfort which naturally is more severe when both sides are ionized at the same time. I have observed that when one side is ionized, it is not uncommon for the patient to experience complete relief even though both nasal chambers are involved. Treatment to the opposite side is, however, usually given within a week after the initial application.

Experience of more than ten years, in private and clinic practice, has demonstrated that satisfactory results occur in approximately 70 per cent of properly selected cases. The improvement is not permanent but lasts from several weeks to several years. The duration of relief depends upon the adequate management of underlying influencing factors as already stated. In most instances it should not be necessary to repeat ionization in nasal allergy for from four to six months, and where the general physical status of the patient has been favorably altered, relief may continue for an indefinite period.

The fact that a small number of patients are not helped at all by ionization but actually made worse simply emphasizes the necessity of careful selection of cases.

Seasonal Hay Fever

Much that has been said in regard to hyperesthetic rhinitis applies also to seasonal hay fever. Ionization for this disease should be given just before or at the very onset of symptoms. The question of *dosage* is very important. If the symptoms are not very acute the usual dosage of 100 to 150 milliamperes minutes may be given (10 ma. for 15 minutes or 15 ma. for 10 minutes equals 150 ma. minutes). In the presence of marked rhinorrhea and sneezing it is best to limit the first treatment to 50 milliamperes minutes. Aggravation of symptoms follows too heroic a treatment which is not essential to obtain the desired result for often only a mild application is all that is required. The rhinologist must exercise judgment in individualizing the dosage. In spite of the favorable effects reported with ionization, a case in which zinc ionization produced an aggravation of symptoms is of interest.

J. C., age 31, seasonal hay fever for 6 years; sensitive to large and small ragweed, and cockle-burr. At the onset of nasal symptoms in August, 1934, a colleague ionized the right side of the nose, the dose being about 150 milliamperes minutes. One week later the symptoms were so

aggravated that asthma complicated the picture. Such severe symptoms had not been experienced before and they persisted in spite of all remedies until the first frost.

About 50 per cent of our patients have had added relief during their seasonal attacks by the judicious use of ionization, but only severe cases have been treated up to the present. The yearly recurrences in these patients seem to be the same as in the untreated ones.

Asthma

Patients suffering from true bronchial asthma occasionally receive quick but temporary relief from nasal ionization. For this reason one is often tempted to repeat the treatment immediately, an error which should not be committed. The appearance of the nose dictates the indication for the treatment, and the decision for second and third treatments mentioned above likewise applies there.

A patient with asthma who responded strikingly to ionization is described in this case report:

Dr. M., age 45, referred for ionization by Dr. F. J. N. Marked asthma with chronic ethmoiditis for 5 years. Two operations gave relief but symptoms recurred thereafter with even greater distress. Four to six injections of epinephrine daily required for relief. After ionization only one to two injections were necessary to give the relief formerly obtained with four to six. Treatment was repeated three times at two month intervals with apparent benefit. Following the last treatment no epinephrine was taken for eight days, and only twice during the following week.

Packing Technic

The technic described eight years ago by Hollender and Cottle⁽⁵⁾ is basically the same as that which has been advocated by all later writers. As reported then, "the technic consists of packing the nose with long strips of gauze which have first been made wet with a zinc solution (one-half of one per cent in strength). The packing must cover as much of the nasal mucosa as possible. When the nasal chamber is properly packed, a flexible wire leading from the galvanic apparatus (positive pole) is introduced into the wet gauze and held in place by some cotton fixed snugly at the nasal opening." The negative electrode consists of a metal plate covered with wool felt thoroughly moistened with salt solution or ordinary tap water. The electrode is applied to the forearm or some other body surface. When both electrodes are in place the current

is turned on for one to two minutes at 3 ma., and then increased to 8 to 15 ma. for 5 to 20 minutes as desired. In some patients it is occasionally necessary to anesthetize the nose before packing it.

After the completion of the treatment, the current is very slowly turned off to avoid shocks to the patient, and the packing cautiously removed. If the gauze is pulled away carelessly, there results denuding of the surface epithelium followed by bleeding. It is sometimes of advantage to give the treatment in the reclining position. Good contacts and thoroughly moistened electrodes should be maintained throughout the treatment.

Ionization of the maxillary sinus or any other of the sinuses which has been made accessible is easily carried out by packing the sinus cavity in the same manner as the nose. The technic otherwise is the same as for nasal ionization.

New Technic

About a year ago Mr. Holmquest of the General Electric X-ray Company suggested the use of a jelly as the electrolyte for nasal ionization. He first made up a preparation containing 6 per cent zinc sulphate. I subsequently modified this formula to a 2 per cent zinc sulphate jelly which had enough consistency to hold well together as a mold in the nose and yet be sufficiently fluid to be injected with a syringe. The formula is: 2 per cent zinc sulphate with 5 per cent tragacanth.

The introduction of this requires no preliminary anesthetic. The nozzle of a syringe filled with the jelly is inserted into the vestibule, directed upwards and backwards until the nasal chamber is completely filled. A small cork is then fitted into the vestibule and through the center of the cork a zinc wire is passed and contact made with the jelly. The other end of the wire is connected to the positive pole of a galvanic apparatus. The negative pole is placed as described for the packing technic. After the treatment by blowing the nose the patient expels the jelly or it may be removed by canula suction. The discomfort of the nasal packing is thus avoided, a fact which renders this technic well suited for children of any age.

Since carrying out experimental studies with this newer technic, I have been apprised of the fact that Friel,⁽⁶⁾ in his book "Electric

Tabulation of Cases Treated by New Ionization Technic

<i>Initials</i>	<i>Age</i>	<i>Sex</i>	<i>Diagnosis</i>	<i>Duration</i>	<i>Previous Treatment</i>	<i>Improvement After Ionization</i>
J. K.	42	M.	Chronic Rhinitis	5 years	Septum operation	Marked
S. K.	37	M.	Chronic Sinusitis Hyperplastic Ethmoiditis	Many years	Septum and Sinus operation Polyps removed	Marked
E. K.	39	M.	Chronic Rhinitis	10 years	Sinus Surgery	Some
S. Z.	46	M.	Chronic Rhinitis	6 mos.	Tonsillectomy	Marked
H. W.	23	M.	Intumescent Rhinitis	2 years	None	Marked
A. D.	38	F.	Chronic Sinusitis and Rhinitis	10 years	Much nasal Surgery	None
A. H.	31	M.	Chronic Rhinitis	5 years	Septum Operation	Marked
J. D.	45	M.	Hyperplastic Ethmoiditis	10 years	Sinus and Septum Surgery	None
P. B.	30	M.	Intumescent Rhinitis	2 years	Much Medical	Moderate
H. S.	40	F.	Chronic Rhinitis Hypertrophy of Turbinate	10 years	Nasal and Sinus Surgery	None
L. S.	23	F.	Papillary Hypertrophy of Turbinates	5 years	Medical	None
L. C.	29	F.	Hyperesthetic Rhinitis	6 years	Medical Tonsillectomy	Marked
H. Z.	22	F.	Hyperesthetic Rhinitis	2 years	None	Marked
S. V.	26	F.	Hyperesthetic Rhinitis	3 years	Medical	Marked
J. DeV.	33	M.	Hyperesthetic Rhinitis and Asthma	4 years	Medical and Septum operation	Marked
C. B.	39	F.	Hyperesthetic Rhinitis	2 years	Medical Ethmoidectomy	Marked
M. S.	37	F.	Hyperesthetic Rhinitis	8 years	Medical	Marked
M. S.	27	F.	Hyperesthetic Rhinitis	5 mos.	Pollen and Medical	None
Mrs. C.	38	F.	Hyperesthetic Rhinitis	8 years	Tonsillectomy Desensitization	Marked
Dr. M.	30	M.	Hyperesthetic Rhinitis	4 years	Desensitization	Marked
E. M.	41	F.	Hyperesthetic Rhinitis	3 years	Tonsillectomy	Marked
S. H.	45	M.	Asthma	10 years	Medical	Prompt relief Recurrence in 2 weeks
G. T.	24	M.	Asthma	5 years	Ethmoidectomy Medical	Relief after 24 hours lasting 4-8 weeks
L. L.	36	F.	Asthma	6 years	Medical	Marked relief after 24 hours lasting 8-10 weeks
B. C.	51	M.	Asthma	6 years	Medical Cholecystectomy Septum and Polyps removed	Relief prompt but persists only for 7-14 days

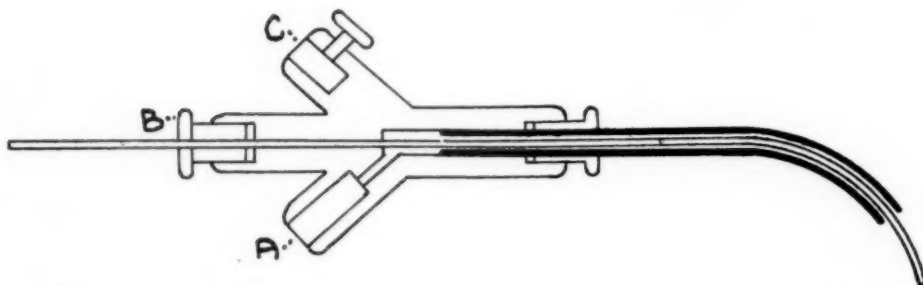


Fig. 1. — Insulated canula for ionizing maxillary sinus through natural or artificial opening. A. Opening for introducing electrolyte with syringe; B. Opening for zinc wire which serves to make contact with solution in the sinus; C. Opening for electrical contact with positive pole.

Ionization" suggested a preparation similar to the one I have employed. Friel's formula consists of zinc sulphate 2 per cent, gelatin 15 per cent and water to make 100 cc. It is quite likely that this preparation will serve adequately as an electrolyte. In any event the principle of its use is the same as with the preparation I have employed.

Technic of Ionization for Chronic Maxillary Sinusitis

Where an intranasal antral opening has been made large enough for drainage of a chronic maxillary sinus, ionization of the sinus can be carried out with the following technic:

The insulated instrument as shown in Figure 1 is passed through the opening into the antrum. The patient is placed flat on a couch or table with the sinus to be treated closer to the table. About 8 cc. of one per cent zinc sulphate solution is then injected with a luer syringe at point A, a zinc wire is introduced at B, and electrical connection made at C.

The negative pole is connected as previously described. The dosage and time of treatment are the same as for nasal ionization.

Record of Cases

A large series of cases has been treated by me with the jelly technic described. A group of these cases has been tabulated to show the diagnosis, duration of disease, the previous treatment and the result obtained.

Summary

1. Zinc ionization of the nasal mucosa is essentially a chemical treatment.
2. The clinical and histological effects are similar to those produced by certain chemicals such as phenol and trichloroacetic acid.
3. Zinc ionization is indicated for improvement of nasal ventilation in intumescent rhinitis.

4. Zinc ionization has produced prolonged relief of symptoms in allergic rhinitis, but the results have been more consistently favorable in the non-seasonal form.

5. Correct technic must be followed in order to obtain the maximum effects of the treatment.

6. The method occasionally produces an aggravation of symptoms but this is usually attributable to improper selection of cases and dosage.

7. A jelly preparation containing two per cent zinc sulphate is advocated as an electrolyte to simplify the technic and avoid the discomfort of nasal packing.

8. Results in a large series of cases in which this new electrolyte was employed were sufficiently favorable to merit advocating its more general use.

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THE ORTHOPEDIC MANAGEMENT OF ANTERIOR POLIOMYELITIS *

A. M. RECHTMAN, M.D., F.A.C.S.

PHILADELPHIA

That early orthopedic measures offer the best results in the treatment of anterior poliomyelitis was definitely confirmed in the 1931 poliomyelitis epidemic in New York City. Investigators for many years have been trying to perfect a serum for the treatment of anterior poliomyelitis, but nothing of proven value is, as yet, available. The ideal procedure would be a form of vaccination to protect those susceptible to the disease; also an early test to determine such susceptibility.

Poliomyelitis always causes a sense of apprehension because of its aftermath. This paper is presented to briefly discuss anterior poliomyelitis, especially its orthopedic phase. Infantile paralysis, anterior poliomyelitis or, more correctly, anterior poliomyeloencephalitis, is an acute infectious disease, at times accompanied by paralysis. The cause is now generally considered to be a true filtrable virus. With the first clinical symptoms of central nervous system involvement the pathological changes in the nervous system are advanced. Serum has proven of little or no value in the treatment of this disease once the virus has combined with the nerve cells.

The epidemiology, pathology and the results of experimental studies on the etiology and serum therapy are all interesting and pertinent to an understanding of this disease, but are not within the scope of this paper. A brief reference to the pathological changes of this disease aids in understanding the mechanism involved in the production of the signs and symptoms and suggests principles to be used in the orthopedic management.

The pathological process is an inflammatory reaction with round cell infiltration, accompanied by an increase in the quantity and pressure of the spinal fluid. The spinal cord changes are most marked in the anterior horn cells at the lumbar and cervical enlargements, perhaps because the blood supply is richest here. These tissues show a cellular exudate, hemorrhage, and edema. Other organs show changes suggestive of the systemic nature of

the disease. The cord damage is caused first, by direct pressure of the hemorrhage, edema, and exudate on the nerve cells; second, by the anemia due to constriction, and third, by direct action of the virus on the cells causing degeneration.

The pain and tenderness of the muscles, which may be severe, are due to sensory ganglion lesions. Primarily there are no pathological changes in the muscle cells. The changes later noticed are due to a loss of diminution of innervation. The patient may recover without residual paralysis, or the palsy may involve a portion of a muscle, an entire extremity, or more.

The orthopedic treatment of this disease may conveniently be divided into three stages. During the first or pre-paralytic stage, there is often muscle tenderness elicited by pressure, or active or passive motion. This tenderness may be limited to a muscle group, a portion or all of an extremity, or may be generalized. It does not necessarily indicate the future site of paralysis. Orthopedic treatment should begin during this phase of the disease by keeping the parts warm and maintaining them in a neutral muscle position.

The second or paralytic stage usually begins about the third day after the onset of the central nervous symptoms and continues until natural muscle recovery occurs, in some cases up to two years. The treatment here continues as in the first stage, together with rest of the weakened parts in plaster until all muscle soreness and tenderness have abated which is usually about six weeks. Following this, judiciously applied physical therapy is valuable. Braces and splints aid in protecting the weakened structures against deformity.

The third stage, that of residual paralysis and deformity, is treated, among other measures, with reconstructive surgery. If treatment of the first two stages is efficient, deformities usually do not occur.

Orthopedic treatment aims to restore a maximum of power to the weakened or paralyzed muscles. Muscle paralysis depends

* From the Orthopedic Services at the Jewish, Atlantic City, and Coatesville Hospitals.

upon the damage to the cord and is not related to the severity of the pre-paralytic symptoms. Some nerve cells are weakened by inflammation and edema, but will recover with the subsidence of the acute symptoms and an absorption of the products of inflammation. Other nerve cells may be permanently damaged by the toxins of the disease and still others may be crushed by the contraction of the scar tissue resulting from inflammation and round cell infiltration. The muscles whose nerve cells have been destroyed cannot be affected by any treatment, but those muscles whose controlling nerve cells have not been completely destroyed may be benefited by efficient care. The primary damage is to the nerve cells and not to the muscles. Treatment aims at keeping the muscles in such a condition that if and when nerve power returns, the muscles will be able to function.

Early determination of the degree of paralysis is often difficult, because of the marked toxicity and generalized temporary weakness. This may be due to a toxic action of the virus on the nerve cells, which does not result in severe morbid changes and so accounts for the rapid recovery which occurs at times within a few hours or days. The patient may be lethargic and respond less readily to muscle testing. If the extremity is maintained in the mid-position the prognosis for recovery of muscle function is better than if the extremity is in the attitude typical of apparent muscle palsy. Occasionally there is progression of the paralysis even though the temperature may be normal. Also, the child may be loath to move the extremity because of severe tenderness, rendering it difficult to determine the degree of muscle power until the acute symptoms subside.

Massage, hydrotherapy, light, heat and electrical treatments are not cure-alls. They have their place, but only when judiciously used and skilfully applied. They continue the nutrition and circulation of the muscles so that when the nerve power returns the muscles may again function. However, because of the great danger of overfatigue, physical therapy may do more harm than good and should be reserved until muscle soreness and tenderness are no longer present. Massage of the weakened areas, especially of the inactive muscles, is valuable and may be continued with benefit over a long period of time. Electricity has its greatest value in muscle testing.

The purpose of baking and rubbing is to force blood through the paralyzed parts and, surely, active function can do this better than treatments. When sufficient muscle action is present to permit function or good motion of a part, physical therapy is unnecessary, aside from the reëducation of the weakened muscles. Muscles may fail to act not alone because of weakness but because of the enforced inactivity the proper coordination between the nerves and muscles may have been disturbed. The latter, however, can be corrected through muscle reëducation.

Supervised exercises to counteract atrophy may be started after the muscle soreness has subsided. Fatigue must be avoided or harm will result with a delay in return of muscle power or irreparable damage may be done. Gentle movements, best done with the patient in a hypertonic (3 per cent) salt solution bath or swimming pool, to eliminate the force of gravity, is a most valuable form of exercise.

Muscle soreness and tenderness are usually early symptoms, often valuable as an aid in pre-paralytic diagnosis. Rest in plaster is undoubtedly the best early measure for this discomfort and should be continued until the symptoms have abated, which is usually from four to six weeks after the onset of the paralysis. Although muscle soreness is usually an early symptom, it may not be present until one, two, or three weeks after the illness. This soreness may occasionally persist for twelve weeks or more. The pain and tenderness denote sensory ganglion irritation and treatment by rest is indicated to prevent further irritation, which might result in added muscle weakness. Rest relieves pain and makes the patient comfortable and so prevents further irritation of the weakened and damaged nerve cells. It also avoids stretching of muscles affected by injury to their nerves and thus prevents contraction of the stronger antagonistic muscle groups. Repeated movement of the joints through their normal range of motion prevents shortening of the muscles and any limitation of motion in the joints. This, however, does not preclude uninterrupted rest in plaster until muscle soreness has abated. In every case the normal range of joint motion was present within a few days after the removal of the plaster.

Early, in the first three to six months of the disease, rest is the most valuable aid to recovery and in lessening the degree of per-

manent injury in those patients badly paralyzed or weakened. Patients with weakness of an extremity without definite paralysis of muscle groups usually remain in bed about six weeks. Those with paralysis in one extremity which tends to recovery, remain in bed for three months and those in whom two or more extremities are involved, with a slow recovery, receive bed treatment for six months or longer. Rest continues either in bed or by the wearing of splints until the muscles become active or the residual stage is reached. The prevention of deformity is a constant aim and may be assured by maintaining the parts in a neutral muscle position or one for correct function. Deformity delays recovery, as contracted structures must be lengthened. A stretched muscle cannot function properly and may degenerate into a fibrous band and be useless even with the return of nerve power.

One should always remember to prevent deformity and the anterior poliomyelitic will be spared much time and suffering from surgery that should have been unnecessary. The paralyzed parts should be kept in an attitude of neutral muscle position. It is easier to prevent a toe drop than to correct it. Keep the foot at a right angle with the leg; the knee straight or in a few degrees (5 to 10 degrees) of flexion and the hips in slight abduction. Sand bags will prevent the lower extremities from rolling in or out. Boards between the springs and mattress and a small pillow beneath the lumbar region may be used to support the spine. The shoulders should be kept in abduction, the elbows flexed to a right angle and the wrists in slight hyperextension. When the joints are treated in this position, the greatest return of muscle power may be expected. The position may be maintained with plaster, splints, or properly fitted appliances.

To summarize, the early orthopedic treatment aims first, to reduce paralysis to a mini-

mum by rest; second, to prevent deformity by the use of plaster or splints; and third, to restore power by muscle reeducation and the use of physical therapy.

Contractions occur at times in spite of all efforts to prevent them and immediate treatment is indicated to correct the contraction. Stretching or tenotomy, with retention in plaster until healing occurs, is conservative treatment. The real place of operative interference in the treatment of anterior poliomyelitis should be after all spontaneous recovery has taken place. The surgeon then utilizes what muscle power remains to reconstruct or best adapt the parts to their previous functions. Nerve operations have practically been abandoned as of no value. Tendon transplantations are only occasionally indicated. The early results are excellent, but later results show their failure to increase power and stability. Nature did not intend extensor tendons and muscles to be flexors, nor adductors to be abductors. The line of pull differs, the functions differ, and a weak muscle cannot replace a strong one. Combined with stabilizing operations upon the bones, however, tendon transplantations serve their best purpose.

The surgical procedures and the charts shown are presented to clarify the mechanics of the principles utilized in the treatment of the residual stage of anterior poliomyelitis, arthrodesis, or the fusion of two or more bones by surgically removing the interarticular cartilage. Surgical ankylosis permits of greater stability where the normal muscle balance has been disturbed by paralysis. Such operations are best done after the age of twelve when there is greater opportunity for bony rather than fibrous union. Tendon transplantations may serve as a temporary measure before this age. It is better to do a preliminary operation and allow function where possible, without deformity and braces, than to have the patient wear a brace until a lasting operation may be done. Braces, by restricting use, cause atrophy of both muscle and bone. Operations may be indicated as an aid to getting a patient out of bed and into braces and at some later time operations may be indicated so that patients may discard braces.

Muscle and tendon transplantations, especially with arthrodeses (bone fixation operations) are most frequently practiced in the foot; viz. the transplantation of an active per-

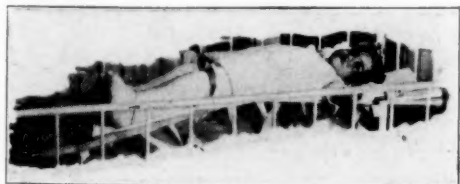


Fig. 1.—The attitude of neutral muscle position: Feet at a right angle and in mid position; knee straight, hips slightly abducted to a right angle as are the elbows; forearm in the abducted, spine supported in slight hyperextension; shoulders mid position and wrist hyperextended.

oneal tendon into a scaphoid for a valgus deformity, and of the tibialis anticus into the cuboid to correct a varus.

Most other transplantations about the foot are, in the final analysis, unsatisfactory. At

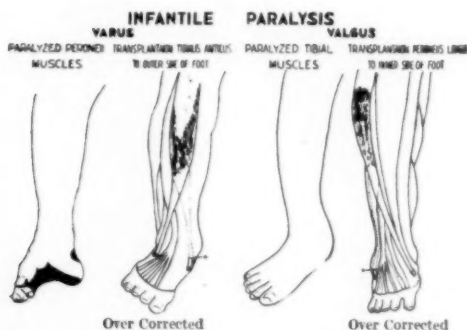


Fig. 2.—Transplantation of an active tibialis anticus to the outer side of the foot to correct a varus due to a paralyzed peroneal tendon; and a peroneus longus to the inner side of the foot to correct a valgus deformity.

the knee the biceps may be transplanted into the patella for a quadriceps paralysis, and at the hip, the tensor femoris into the femur for a gluteus medius paralysis. For

TRANSPLANTATION OF BICEPS INTO PATELLA FOR QUADRICEPS PARALYSIS

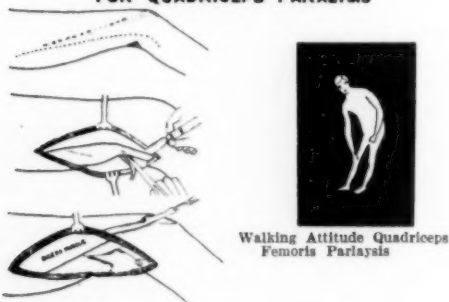


Fig. 3.—Transplantation of the active outer hamstring muscle into the patella for a quadriceps paralysis.

a flexion contraction at the hip the origin of the flexor and abductor muscles may be transferred to a lower insertion to correct the deformity. Transplantations at the shoulders and elbow joints have been disappointing except in rare instances, but the results at the wrist and hand have been more encouraging, undoubtedly because the long tendons and the elimination of weight bearing are valuable aids. Stabilizing operations upon the bones have proven more efficient and enduring than surgery upon the soft structures. An astraglectomy with backward displacement of the

TRANSPLANTATION TENSOR FEMORIS FOR ABDUCTOR PARALYSIS

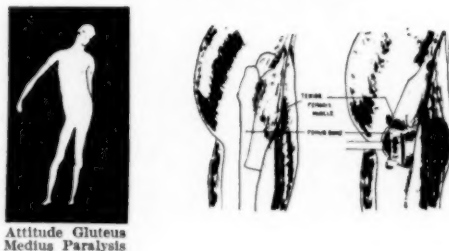


Fig. 4.—Transplantation of the tensor vagina femoris muscle into the shaft of the femur for a gluteus medius palsy.

CAMPBELL OPERATION

LEXION ABDUCTION DEFORMITY OF HIP

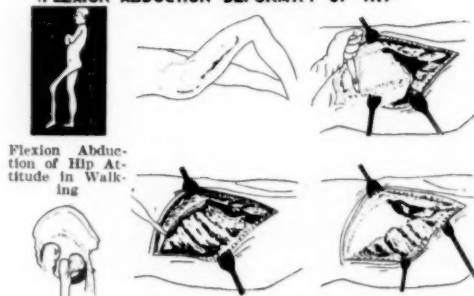


Fig. 5.—Transferring the insertion of the flexor and abductor muscle of the hip to a lower area of insertion to correct a flexion deformity at the hip. (This illustration has also a relationship to Fig. 8.)

foot, as suggested by Whitman, has had the test of time and has a wide applicability as a method of stabilizing the ankle. The backward displacement of the foot changes the line of weight bearing, increases the length of the fulcrum and aids in restoring balance. This operation was originally devised to correct a calcaneus deformity due to a paralyzed calf muscle, but its scope has since been wid-

ASTRAGLECTOMY

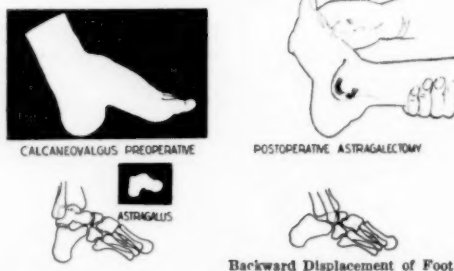


Fig. 6.—The astraglectomy to stabilize the ankle and displacing the foot backward to restore balance for a calcaneovalgus and other compound foot deformities.

ened to include many compound deformities of the foot. A Campbell bone block, or the operation as modified by Gill, back of the ankle, is an adequate means of correction of foot drop. The bone block acts as a check to plantar flexion in much the same manner as a door stop checks a door.

A subastragalar arthrodesis is perhaps the best means of stabilizing a foot with a lateral deformity, as varus or valgus. This may be combined with a backward displacement of the foot to further restore balance. At times tendon transplantations may be combined advantageously with these foot stabilizing operations. Arthrodesing operations at the ankle

CAMPBELL BONE BLOCK

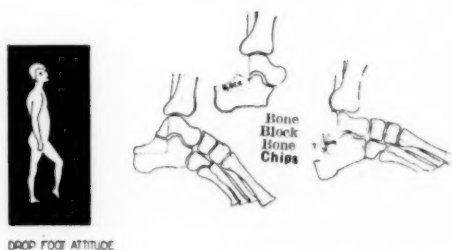


Fig. 7.—The bone block operation at the back of the ankle prevents plantar flexion of the foot to correct an equinus deformity much as a door stop checks a door.

joint are now seldom done, as a stiff ankle is uncomfortable and the attitude in walking is ungainly. An astraglectomy often gives better results. Arthrodesis at the knees, hip, or elbow is seldom done for anterior poliomyelitis, but fusion of the posterior arches and spinous processes of the spine prevents the increase of a scoliotic deformity. Fusion of the shoulder joint for paralysis of the deltoid muscle restores a useful range of abduction.

Surgery of anterior poliomyelitis constitutes a large part of the work of the orthopedic surgeon and this, with the early use of orthopedic measures and principles, is the treatment of choice in anterior poliomyeloencephalitis and must remain so until some prophylactic, medicinal, or serum treatment is found to prevent the occurrence of paralysis in these cases.

FASCIOTOMY FOR FLEXION CONTRACTION OF HIP SOUTTER OPERATION



Fig. 8.—The subastragalar arthrodesis fuses many bones into one to prevent a lateral deformity of a paralyzed foot and combined with a backward displacement of the foot, combines stability and balance.

Conclusions

1. Rest, both local and general are imperative. The early application of plaster with the onset of the paralysis, also with the advent of muscle soreness and tenderness and continued until these latter symptoms abate, is undoubtedly the best measure at our command as regards potential recovery of weakened muscles.

2. Physical therapy is an aid after tenderness has subsided, but must be used with caution so as to avoid overstimulation of tissues weakened by disease.

3. The prevention of deformity is a constant aim. Surgical interference then becomes entirely reconstructive. Tendon transplantations are of value at times, but in the region of the foot and wrist give their best results when combined with arthrodesing (bone fixation) operations.

4. Stabilizing operations have proven more effective and enduring than surgery upon the soft structures.

5. Orthopedic measures at present offer the best results in the treatment of anterior poliomyelitis.

6. The term "infantile paralysis" is not accurate and should be discarded. "Anterior poliomyelitis" is better.

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RELATION OF BODY MECHANICS TO SURGICAL DIAGNOSIS *

WILLIAM BATES, M.D.

One of my instructors in surgery — the late Dr. John B. Carnett—gave two statements to us as undergraduates, which were the beginning of my interest in this subject. One statement was, that one should never operate upon an abdomen without examining the back. The other statement was, in effect, that if the pain the patient complains of overlaps the confines of the cavity containing the organ supposed to be the seat of the pain — reconsider the diagnosis. Although these statements were made over twenty years ago, it was not until eight years ago, that they were actually connected sufficiently for their author to report his studies⁽¹⁾. Other articles a few of which I have been co-author, have since been published.⁽²⁻³⁻⁴⁾

The first of these statements — examine the back before operating — was forced home on Dr. Carnett by his very first private patient. A young lady from his home town, who came to see him with symptoms frequently diagnosed as chronic appendicitis. Her appendix was removed and during her stay in the hospital she seemed to be better. Six months later she returned with the same symptoms — particularly pain over the right lower quadrant of the abdomen. She was referred to a now prominent gynecologist who took out her right ovary. As before, she seemed improved while in the hospital.

Three months later she again returned complaining of the same pain. We frequently see this sequence today and all too frequently either the patient or the physician explains it by adhesions resulting from the operation. In examining the patient this time, Dr. Carnett had her stand with the back exposed and found a scoliosis with one hip higher than the other. On measuring the legs, he found the right one three-eighths of an inch shorter. He had the heel raised on the one shoe and sent her home to try the effect of the correction. This was over thirty years ago and careful questioning of this patient shows that she has never had further pain in that part of the ab-

domen, nor has she ever had further operations.

Since that time, abdominal pain, especially in the absence of fever and muscle rigidity has led us to examine the spine carefully. Curiously though, examination of spine does not give the same information to each examiner. A scoliosis has always meant to us to examine the length of the leg and to correct even the slight shortening by change of heel. We liken the legs to the foundation of a house. If it is uneven, the superstructure must be strained to maintain an upright position. Fortunately, the body superstructure is so constructed that compensatory curves result instead of a "Leaning Tower of Pisa" effect.

In examining graduate students, we found four out of every seven to have one lower extremity shorter than the other. The dispensary patients sent to us show an even greater proportion. In spite of these figures, I have repeatedly seen exercises, casts and braces ordered for patients with scoliosis without previous measurement of the legs.

Measuring leg length is not always a simple procedure, especially in the obese type, but we determine it in three ways — tape measure with the patient lying, tape measure while standing, and placing of blocks of wood under the heel to bring the iliac crests to a level⁽⁵⁾.

Having determined the degree of shortening, if a block of proper thickness under the short leg does not correct the scoliosis, either some error in measurement has been made or else the scoliosis is of the fixed type which will not respond to such treatment.

All cases of abdominal pain, however, do not have scoliosis and short legs, which brings us to the second statement of Dr. Carnett concerning pain over-lapping anatomic boundaries. For instance, when a patient complains of pain and points to the site with one finger, it usually means that there is something definitely wrong. If the patient uses the whole hand to indicate the area of pain, it may mean one of two things, either a more diffuse, abnormal process, or a less definite impression

* Read at the Thirteenth Annual Session of the American Congress of Physical Therapy, Philadelphia, September 13, 1934.

as to where it is. If the outstretched hand is entirely over the chest or entirely over the abdomen, the contents of those cavities must first be considered. On the other hand if the hand overlaps the abdomen and upper thigh, or the upper abdomen and lower chest, then the patient is more apt to have something in the surface covering of the body rather than in one of the cavities. As a concrete example and also as an illustration of combining both these dicta, I have seen a patient complaining of pain in breast and on examination found tenderness not only of the breast, but also of the chest wall. On examining the back, I could apply pressure close to spine over the intercostal nerves and reproduce the pain originally complained of in the breast.

Shortly after the World War I met quite a few cases of painful breasts in my dispensary practice and it was customary to use a high frequency current posteriorly over the same side of the chest. We made no diagnosis other than "painful breast." Today we treat those same cases for neuralgia of the chest wall, for we have found, that whether or not there is a lump in the breast, the commonest cause for painful breast is intercostal or parietal neuralgia.

Many patients using the flat of the hand to the abdominal wall to indicate the seat of pain may not overlap the anatomic boundaries of the peritoneal cavity, and yet the pain is not within the abdominal cavity. In various places⁽⁶⁾, the causes have been reported and the striking resemblance to gall bladder disease⁽⁷⁾ and appendicitis^(8,9) have been detailed.

Tests to differentiate between parietal and visceral pain were devised by Dr. Carnett⁽¹⁾ which I believe will eventually stand as a monument to his name. Although the pinching and poking tests⁽¹⁾ of the abdominal wall have received most notoriety because they are painful, the outstanding test was what he called the A-B test.⁽¹⁾ This consists of examining the abdomen with muscles relaxed (A) and then with muscles rigid (B). The presence or absence of tenderness on the second part of the test is so important in all abdominal cases, that I feel that when it is in common use, it will be recognized as a most valuable differential test.

In detail, with the patient lying relaxed, pressure on the abdominal wall may yield tenderness — this means that the tenderness may

be in the abdominal wall or in the viscera immediately underlying it. The patient is then instructed to tighten the abdominal muscles (straining — raise head or raise heels with knees straight.) Pressure is again applied and if tenderness is absent, the source of trouble is considered visceral. If tenderness is present with the abdomen tense, then it surely is in the abdominal wall but there may also be some in the underlying tender viscera, such as the appendix or the gall bladder. We then inject two per cent solution of novocain into the abdominal wall⁽⁵⁾ and repeat the tests. When pressure is applied with muscles relaxed and the overlying abdominal wall desensitized, if tenderness results we have visceral trouble, otherwise it is in the abdominal wall. With abdomen tense — if properly injected — no tenderness results when pressure is applied. As the injection of novocain does not decrease the tenderness of acute or inflammatory visceral disease, this test is used by us routinely in acute abdominal pain.

As we examine the back of practically every patient standing before having them recline, we get an opportunity to observe the antero-posterior curves of the spine and the corresponding curvatures of the anterior surface of the body in profile. These studies have led us to some interesting findings and have been helpful for proper therapeutics. As an example of these findings a lordosis means visceroptosis.⁽³⁾ True, we may have no lordosis and some visceroptosis, but it is rare and is usually due to relaxation of the anterior abdominal wall by some such factor as pregnancy or chronic infection. To help these lordotic patients with visceroptosis, correction of the lordosis is absolutely essential. As lordosis becomes more marked compensating kyphosis of the dorsal spine occurs which allows the chest to sag, the diaphragm to become lower, the heart to change position and the lungs to be improperly aerated.

As a result of this sequence we get circulatory disturbances of venous stasis leading to constipation, dysmenorrhea, hemorrhoids, varicose veins, orthopedic defects of all the weight-bearing joints, and chronic pulmonary changes.

I do not desire to be misunderstood that poor posture is the sole factor in producing these conditions, but when posture is poor enough to cause circulatory changes it is a vital factor in the production of these disor-

ders. Postural defects do not have to be extreme to cause these changes, as has been shown by improvement obtained by proper posture exercises. Many cases with localized pain obtain complete relief with only one-quarter or three-eighths of an inch lift under a heel and refuse to go on with exercises.

Many cases of headache, shoulder pains, most cases of backache, and many so-called sacro-iliac pains are largely postural in origin⁽²⁾. As previously⁽⁵⁾ reported infection may cause symptoms to appear in areas influenced by poor posture. The infection can be cleared up, but the symptoms will persist until the postural defect is corrected. In clearing up symptoms, pain disappears long before tenderness does.

Considering the number of conditions caused or made worse by poor posture, a few of which I have mentioned, I think this organization is the proper one to encourage a better understanding and interpretation of posture and more sensible methods of improving body mechanics by familiarization with and teaching of proper methods of posture correction. The exercises advocated by Dr. Goldthwaite^(10, 11) are of greater usefulness and physiologically more sound than any other with which I am familiar.

Conclusions

1. Postural defects cause disease.
2. Postural defects lead to errors in diagnosis.
3. Postural defects can be recognized.
4. Postural defects can be corrected, or at least improved in most cases.

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Discussion

Dr. S. Kleinberg (New York): The chief note sounded in this paper is for us to be physicians first and specialists later. It seems to me that first and foremost we must examine a patient from every point of view in order to obtain every possible fact regarding the symptoms and the tissue changes in back of it — all this without prejudice.

I would like to cite a case to you, which has an important bearing on this discussion. A woman had for many years been suffering from abdominal pain in the right upper quadrant. She had been under the care of the internist who regarded her symptoms as fairly definite of gall bladder. She was so treated for months, but the gall bladder distress continued. She was eventually referred to the orthopedic division at the Hospital for Joint Diseases in the hope that they might find the cause and provide relief of her symptoms. We completely disregarded what had been done before. We took a complete history and made a thorough physical examination. The history disclosed that the patient had suffered from low backache. In our examination, it was evident that she had pain and tenderness in the upper right quadrant of the abdomen. It was equally evident that she had a marked lumbricosis, with tenderness of the lumbosacral area. Upon further examination we stated it was a partial dislocation of the fifth lumbar vertebra. A spine fusion was advised and later performed. This is a matter of over a year ago and she has been completely relieved of all of the abdominal symptoms.

That indicates to me sharply the need for a complete physical examination without the specialist centering himself on those things which interest him the most.

Regarding abdominal pain, to which the essayist devoted much of his time, we must appreciate that abdominal pain is very often due to the expression of a lesion at some distance from the abdomen as it is to something within the abdomen. The consideration, it appears to me, is this: when we have a patient with abdominal pain, if there is no evidence of acute intra-abdominal, medical or surgical disturbance, then we must seek out all the other systems that may possibly explain abdominal pain. We know that

in orthopedic and neurological conditions very often abdominal pain is the expression of a lesion at some distance from the abdomen.

Scoliosis, as you have heard, often causes abdominal pain. Yet, you want to remember that while scoliosis is a very common condition, it is only in the adult that it causes abdominal pain. Very rarely does it cause that pain in a child. In an adult we will also get pain in a distant body caused by scoliosis. Yet, the correction of a scoliosis will not necessarily remove a lot of symptoms that may not be related to it at all.

I want to cite another case to you. A young girl, with an evident lumbar scoliosis complained of pain in the lower part of her anatomy radiating down both lower limbs. She had been under the care of the physician for many months. He finally concluded that she must be suffering from the effect of scoliotic changes and referred her to me for the application of a jacket. When I examined her it was quite certain that she had a lumbar scoliosis with a shortening of the one limb. Her pain did not seem to have any reference to the scoliosis. She had a very fair degree of movement in her spine. There was no tenderness anywhere about the intervertebral spaces. The x-ray pictures showed no bone changes that would indicate pressure on the outgoing nerves. I refused to admit that scoliosis in that particular individual was responsible for the pain. I suggested that she be taken to a hospital for observation. That was done. While she was in the hospital, she had an attack of violent pain at about three o'clock in the morning. Investigation showed that the pain was in the lower part of the abdomen, and rather generalized. She had a slight rise of temperature. Upon advice she was operated and an ovarian cyst was found and removed. She has been completely relieved of her pain.

Abdominal pain may be due to a great many lesions in the spine. Almost any lesion in the spine can cause abdominal pain. I need not go through the list of such possibilities, but I would like to mention to you such conditions as vertebral malignancy, fractures and dislocations of the spine.

Also, it is imperative to remember that a fracture or a dislocation of the spine may give very mild symptoms. I remember the history of one boy in particular, who fell while he was climbing a hill. Subsequent to that he had mild pain in his back and very mild pain in his limb. But, there was a continuously increasing disability to a point where it was thought he was exaggerating his symptoms. As a matter of fact, he had a spondylolisthesis, which was amenable to treatment.

A most difficult problem is the differentiation of abdominal lesions from the vague symptoms of cord tumor, which give us the greatest amount of trouble; up to the time that there is an actual severe pressure on the cord the neurological symptoms may be so vague as to entirely prevent a diagnosis.

I remember a man of 55 years of age who tried to open the door of his garage. He had

immediate pain in his back and in the groin. It was thought for a time that possibly he was having difficulty with the intestinal tract. Not much attention was paid to the back. After weeks and months I was called to see him. He did have a severe list to one side with a rigidity of his spine and marked local tenderness. The abdomen was absolutely negative. The diagnosis seemed to be a simple sprain of the sacroiliac joint with a slight scoliosis. I advised giving him some support. The doctor applied it without using any kind of violence at all. That same evening the man had a total paralysis of one limb. Within a few days it was evident that he had an intravertebral lesion. Subsequently it proved to be an extradural tumor.

One of the things that we are confronted with in young adults is the problem of a round, hollow back in the tall, thin girl or boy. We may have a longer series of symptoms there referable to the intrathoracic and the intra-abdominal organs. The ptosis of the abdominal organs is usually accompanied by a ptosis of the heart. This we can see under the fluoroscope and in the x-ray film. It is no wonder that many of these individuals suffer from a tachycardia, gastrointestinal disturbances, or from menorrhagia and other uterine difficulties.

Therefore, in studying a case of round, hollow back, we must bear in mind that not only may there be symptoms directly referable to the dorsal or lumbar spine, but to parts distant from it and particularly in the chest and abdomen.

The correction of such symptoms is not as simple as one might suppose, because the older the individual the more difficult it is to change a faulty posture. I wish that weren't so. But one must remember that in an adult not only the skeletal system but the soft tissues, the muscles and the ligaments are all more or less fixed in their position. Sometimes not only is it difficult but dangerous to attempt to forcibly correct and alter the posture to which the individual has been accustomed for years.

Dr. William Benham Snow, (New York): There is the problem of the painful shoulders, simulating angina pectoris. Very many cases of pseudo angina pectoris are due to these so-called painful shoulders. While here the diagnosis may often be in dispute, we are certain to provide amelioration of symptoms by the intelligent use of physical means, such as heat, rest, or the static wave current.

As Dr. Kleinberg said, the time to treat scoliosis is in childhood. At the posture service of the Vanderbilt Clinic we are obtaining good results along that line. Children are given proper therapeutic exercise, their nutrition is supervised and improved, both by medicinals and foods. A complete record is kept of their progress both for statistical and therapeutic enlightenment.

The question of leg measurements interests me very much. I advocated that whenever leg measurements are taken they should be taken from the iliac, the spine, and from one or more central points. Very often measurements will be

the same for iliac spines and will be different from other points. Those measurements are very helpful in pointing out conditions of the lower back.

Dr. John Howell (Philadelphia): I was interested in Dr. Kleinberg's point on scoliosis in childhood causing abdominal pain. I want to emphasize that we realize that abdominal pain is not entirely due to faulty body mechanics. That is why we emphasize the methods of examination for pain and tenderness in the abdominal wall by the test devised by Dr. Carnett.

I agree that most of the cases of abdominal pain which we are asked to see are due to acute intra-abdominal pathology. We do not see much of the neuralgia in the abdominal wall in childhood, except in the cases of acute toxemia due to upper respiratory infections, tonsillitis, middle ear disease and acute respiratory diseases. Most of our cases due to posture changes are in the young adult, 20 to 30 years of age. In the adult, cases of neuralgia are apt to be associated with arthritis, and osteoarthritis of the spine.

Dr. Walter Truslow (Brooklyn, N. Y.): Many of us as physicians have written out prescriptions for our patients in many cases, but how many of us have ever written out a prescription like this: "Take lying on the back, knees drawn up, feet resting on the floor, bend both knees to the chest ten times. Raise right thigh, leg, foot to the horizontal ten times; raise left thigh, leg, foot to the horizontal ten times. Take these exercises once a day, an hour after breakfast." That is one of the strongest points of the excellent paper that we have just heard.

The principles of exercise as a therapeutic agent should be taught in our medical schools. I understand something of that is done in the University of Wisconsin. Exercise properly graded and intelligently directed is profound in its therapeutic effect. Physicians must get away from the blanket statement to our patients that they need more exercise and that they should somehow go out and take it. We must show it to them and do it with them and not leave it to haphazard and fleeting effort.

As an orthopedic surgeon I give foot exercises, which allow the patient to make a more rapid recovery. Exercise, from the physician's point

of view, has two purposes. First, there is general hygienic effect; and second, specific remedial effect on a particular part of the body. The essayist has concentrated his paper on specific exercises for hernia, fractures and certain anatomical classifications of parts of the body.

In speaking of hernia, we noted that the examples of exercises given are rightly in the supine position. He pointed out that there must not be in these abdominal muscles the strain of intra-abdominal pressure. I might take exception to one of the exercises named in which is required sitting with the hands on the hips and bending the trunk backward with a twist to the right and left; that might not be quite within the safe limits. However, we suppose those are to be given in very careful gradations.

In treating fractures, the essayist condemns too long immobility and advises early physiotherapy — massage, heat and passive motions. That is absolutely correct. The thing that impresses me most is the ease with which these can be understood and done.

The paper is excellent in that it brings forward the need of gymnastic therapeutics as part of our armamentarium and adds materially and specifically to the uses of muscle training in certain orthopedic conditions and especially in that it places gymnastic therapeutics in its place.

Dr. James Claude Elsom (Madison, Wis.): Golf is at times prescribed as an exercise. That is a very splendid exercise, but when one is leading a sedentary life all of the week and then goes out during the week-end and plays 18 holes of golf, that is not the best form of exercise. It is an overdose which is quite disastrous. Five or ten minutes of exercise a day, regularly, is very much better than two or three hours taken all at once during the week-end.

In our modern civilization we are no longer obliged to use our muscles in order to make our living as our primitive ancestors did. That is extremely unfortunate because of the fact that owing to our muscular insufficiency our civilization will some day carry us down the hill.

If any man wants to be happy and efficient let him get sufficient exercise, but he should also get sufficient rest. When we get a goodly portion of these two I think we will all live happily ever afterwards.

DELAYED UNION OF FRACTURES *

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In any argument one must first define terms and establish basic fundamentals from which to work. Accordingly we must first define, when a fracture is "delayed" in its union, when it is considered to be normal but slow, and when it is to be considered as ununited. The rate of union varies considerably with individuals who might otherwise be classed as normal, and yet in whom union will be delayed or will not occur of its own volition. There must therefore be some unknown factor in people belonging to this group, which makes them abnormal. Within recent years many explanations have been offered for this abnormal situation which are conclusively proved to be correct. Some of the general causes of delayed union are syphilis, malnutrition, osteogenesis imperfecta, disturbed calcium and phosphorous metabolism, and like conditions which retard osseous metabolism. None of the cases in our series had the duration of fracture of less than three months standing.

There are some important local factors also which, alone or combined with others may cause delayed union. Some of these are: Improper or insufficient immobilization; too short a period of immobilization; insufficient reduction; and damage to the nutritional circulation. A refracture through good but not fully organized callus will frequently lead to delayed union.

A delayed union becomes an ununited fracture when the bone ends show sealing with eburnated bone and have clinically abnormal mobility without pain, this for a prolonged but somewhat arbitrary time. The eburnated fragment ends are best determined by studying x-ray films.

The common sites for delayed union are the tibia (middle - upper thirds), the forearm, especially the radius, and the humerus. Of course, any bone may be delayed in

union but the above group seems to comprise the majority, as will be noted in the following seventeen cases. Most of the fractures are transverse in type though some are comminuted while others infrequently are oblique.

The treatment of delayed union fractures should begin with the primary reduction of the acute fracture and should coincide with the other succeeding phases of early treatment; in other words, preventive surgery should be practiced in all cases, especially those of a suspicious type. It would be ideal to have suitable blood analyses of all fracture patients, to have proper bone building diets, to give bone stimulating medication, and to utilize some suitable physical modality, but unfortunately this can be done only in a limited way due to lack of facilities or economic situations prevalent in most places. In our series none of the above accessory aids to primary surgery were used until the fracture was classed as "delayed."

In considering the above mentioned series of seventeen cases I should like to point out that they did not receive their acute stage treatments in any one hospital, from any one individual or by any one system. Consequently all present discussions must begin with the delayed union even though some had had open operations of various sorts at different lengths of time after the recent injury. The operative procedures and the methods of primary reduction and immobilization, both pre- and postoperative, cannot be evaluated here. Suffice it to say that each case was considered by us on its face value, that every case was fractured longer than three months, and that non-operative conservatism was used to establish union which has occurred in all cases except three which are too recent to be considered. I have seventeen cases to present, which differed somewhat in the details of their treatment, but which in general may be divided into two groups ther-

* Read at the Eastern Sectional Meeting of the American Congress of Physical Therapy, Baltimore, March 30, 1935.

peutically, and three groups anatomically. Only one case had any surgical intervention during the course of physical therapy.

Therapeutically the two main divisions are based upon the use of diathermy in five cases and passive vascular exercise in eleven cases; one case is receiving both of these modalities simultaneously. Walking-plaster casts or leather braces were used in all cases of the lower leg so that immobilization plus the added stimulation of end to end weight bearing might be utilized, whereas plaster or form-fitting leather casts were used in the other cases for purpose of immobilization. No specified length of time was set for each case, but the apparatus was employed until good union was evident.

Viosterol, diets high in calcium and phosphorus, and ultraviolet light (artificially or by direct sunlight) were used whenever possible, but since the majority of the patients could not be closely watched and controlled, we are not definite as to how consistently the above were followed. We feel justified therefore in believing that dia-

thermy and passive vascular exercise were the major factors in the results.

The five cases treated by diathermy consisted of three fractures of the lower leg and two of the humerus, and all were united for three months except one of the lower leg cases which was four months. The treatments per patient were divided as follows: two lower leg cases treated twelve times each, one humerus twenty-eight times, one lower leg thirty-six times, and one humerus forty-one times, with union in every case by the end of the treatment series.

As a rule the double plate through and through method was used with a current of about 350-450 milliamperes. One case was treated for a while by the double cuff method due to the bad condition of the skin. The treatments were given as a rule every other day and x-ray films were made at the beginning and end of the treatment period. X-ray evidence of thickened callus did not always appear as promptly as the clinical improvement.

The twelve remaining cases were treated

Name	Age	Color	Sex	Location and Type	Months Ununited	Number of Treat.	Clinical Union	Union by X-rays	Remarks
I.K.	51	W	M	Humerus: simple multiple:	3	28	+	+	Poor early splinting. Also ribs, elbow, forearm, skull
P.McC	33	B	M	Humerus: comp.-commin.	3	41	+	+	
D.H.	43	W	M	Tibia and Fibula: commin.-simple	3	12	+	+	Contusions and lacerations
I.F.	12	W	M	Tibia and Fibula: simple	3	12	+	+	Malnutrition
J.W.	50	B	M	Tibia and Fibula: commin.-simple	4	36	+	+	Also other lower leg — normal union
37-4/5 ————— Average —————					3 1/4	25-4/5	+	+	

Chart 1. — Diathermy Chart.

J.L.	32	W	F	Radius and Ulna: simple	3	16	<div> <div>Rad.+ Rad.+ Open reduction both bones 6 days post-injury</div> <div>Ulna—Ulna—2nd open reduction ulna later: good function now</div> </div>		
J.F.	30	W	F	Radius and Ulna: simple	6	22	+	+	Open reduction early post-injury
A.F.	40	W	F	Tibia and Fibula: simple	3	39	+	+	Definite improvement after 8 R
G.H.	43	W	F	Tibia and Fibula: comm.-simple	4	21	+	+	Definite improvement after 6 R
H.R.	30	W	M	Tibia and Fibula: simple	4	19	+	+	Definite improvement after 12 R
R.H.	32	W	M	Tibia and Fibula: multiple-simple	6	17	+	+	Definite improvement after 12 R
H.M.	38	W	M	Tibia and Fibula: comp.-comm.	5	24	+	+	
J.H.	47	W	M	Tibia and Fibula: simple	10	25	+	+	Definite improvement after 7 R
H.H.	54	W	M	Tibia and Fibula: comp.-comm.	12	24	+	+	Definite improvement after 16 R
38-4/9 ————— Average —————					5 3/4	23-1/9	When sequestrectomy was done		

Chart 2. — Passive Vascular Exercise Chart.

with passive vascular exercise, that is the use of negative and positive pressure rhythmically applied somewhat according to the ideas advanced by Herrman and Reid of Cincinnati. Three of these cases are too early for consideration. The periods of non-union varied as follows: The two forearm cases three and six months respectively; the legs one for three; two for four; one for five; one for six; one for ten; and one for twelve months.

The method of treatment was fairly standard for all cases in that a positive pressure of twenty millimeters of mercury and a negative pressure of eighty millimeters of mercury at an average cycle-frequency of nine per minute were used three times a week in combination with local splinting and rather inaccurate general measures as previously mentioned. One case had some surgical procedure during its course; i. e., sequestrectomy after the sixteenth treatment, with union becoming complete after eight more. It is to be remembered that we are dealing with delayed union fractures

only, that is to say, at a stage when a higher pressure value may be used without fear of embolism.

The cases might be tabulated according to the anatomical location of the fracture, the period in months of non-union, and the number of treatments necessary to obtain union. All the patients show x-ray as well as clinical evidence of union. (See charts 1 and 2.)

It is our definite impression that both of these methods are invaluable in the treatment of delayed union of fractures and that there is a minimum of danger to the patient, provided the proper precautions in the technic are used. Too high milliamperage of diathermy may cause callus destruction, so that one should keep below 500 milliamperes as an arbitrary maximum, and below skin tolerance as an individual maximum. There would probably be no objection to daily treatments instead of alternate days, but due to practical difficulties the latter has been followed throughout.

4 East Madison Street.

ARTHROSCOPY BY FLUORESCENCE *

(An Experimental Study)

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and

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In a previous fundamental study⁽¹⁾ we described the appearance of joint cartilage, normal and diseased (either natural or experimentally produced), under filtered ultraviolet radiation. It was then proposed to construct an instrument similar to the arthroscope or cystoscope, containing an intrinsic source of ultraviolet radiation and a proper optical system, to visualize fluorescent effects within the knee joint, after filtration of the ultraviolet radiation. A similar idea for endoscopic fluorescence was also suggested by Körbler⁽²⁾. It has not been possible thus far to make such an

instrument, nor are the instrument makers sanguine of its ultimate production, despite the fact that endoscopic instruments bearing ultraviolet sources have already been made by Westmann, Saidman, and Loeck^(3, 4, 5). No small source of radiation emits enough rays in the region of 366 millimicrons to give good fluorescent effects. This is especially true of the cold quartz lamp.

It was, however, decided to test the possible usefulness of arthroscopy by fluorescence experimentally. For this we used a small water-cooled, hand mercury vapor lamp, the radiation of which was filtered by a properly fitting filter of nickel oxide glass. A quartz

* From the Hospital for Joint Diseases, New York City, the service of Dr. Leo Mayer.

rod, about six inches long and one-quarter inch in diameter, attached to the lamp, conducted the filtered radiation into the joint. The following procedure was used in a few knee joints of cadavers. The quartz tube was introduced into the knee joint through an incision large enough to admit it. It was then screwed on to the hand lamp with the filter in place. The arthroscope was inserted into the opposite side of the joint. The joint was now distended with water, which does not obstruct the passage of the radiation. Since fluorescent effects are best seen in the dark, the electric bulb in the arthroscope was not used to light up the interior of the joint. The lighting-up of the joint space was to be accomplished by the filtered ultraviolet radiation transmitted into the joint through the quartz rod.

The quantity of radiation sent into the joint by this means is much greater than any that can be introduced by an intrinsic source of ultraviolet radiation within a properly designed instrument. A large number of rays having the proper wavelength of 366 millimicrons are emitted by the mercury vapor lamp, much more than can be introduced by any other sort of lamp. Yet, it was never possible to secure visual detail. A faint, bluish fluorescence, even in the presence of injected eosin, was all that could be seen.

Further research should be carried on to demonstrate the practical possibility of this

probably valuable diagnostic method. It is important that a good endoscopic instrument bearing an ultraviolet source be constructed, especially for the irradiation of the urinary bladder (Caulk and Everhardt⁽⁶⁾) and other body cavities.

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(Special Article)

THE AMERICAN CONGRESS OF PHYSICAL THERAPY: TEN YEARS OF PROGRESS *

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CHICAGO

Permit me to recall to those who were with us in the early years of the Congress and to inform those who have since become affiliated, that the organization has grown and developed into its present influential status because of an absence of politics within its own ranks. At no time during the ten years of my incumbency have I ever been confronted with problems of a political nature. As a result of the absence of the usual internal wrangling, so inordinately present in many medical bodies, the Congress has directed all its activities strictly along scientific lines.

The Congress is the outgrowth of a small informal gathering of physicians who met in Omaha about thirteen years ago for the purpose of cultivating physical therapy. The outstanding figures in this humble beginning were Drs. Tyler and Fouts, to whom more than any others, the Congress owes a debt for the solid foundation they laid. After a few meetings in Omaha, the annual session was held in Chicago, in 1924, under the presidency of Dr. Curran Pope. From then on, the sessions of the Congress became noteworthy events in the progress of modern physical therapy.

The Earlier Annual Sessions

The annual session at the Drake Hotel in 1926 was a momentous occasion. The presence of outstanding European authorities helped to make the occasion especially auspicious, and when about 1200 physicians registered for the instruction classes and scientific sessions, it became evident that physical therapy was to occupy a prominent position in present-day medicine. Cumberbatch, Nagelschmidt, and other prominent foreigners have honored us with their presence, their scientific contributions, and their enthusiastic interest in every phase of light therapy, electrotherapy, hydrotherapy, massage, and corrective exercise.

At subsequent annual gatherings, Sonne,

Friel, Riviere and other prominent figures have taken part in our program.

The Congress has always emphasized the importance of the annual conventions. These have served for an exchange of scientific views, the imparting of fundamental information to the novice, the acquisition of new membership, and, more important still, the creation of a warm and sincere fellowship such as exists in few medical bodies.

The successes of these earlier annual sessions carried the Congress along for several years without financial obligation. The commercial exhibitors became larger in number, and the attendance at each session was numerically sufficient to carry the expense of the convention on registration fees alone.

Some Facts About Archives

During that period, the Congress managed quite successfully, for it was not burdened with the publication of its present official journal, the ARCHIVES. This load was carried by our good colleague, Dr. Tyler, who, however, soon presented title to this property to the Congress. This was indeed a commendable act, and one for which Dr. Tyler's name should forever be held in esteem by this body.

Unfortunately, however, the ARCHIVES was a bad investment from a business point of view, with only a handful of subscribers and practically no advertising contracts. Furthermore, a number of subscriptions had to be satisfied without income for periods varying from a few months to one year. The task of reconstruction was especially difficult, for we were just then embarking upon the worst period of the depression.

Without attempting to review the incidents in chronological order, it suffices to say that the ARCHIVES lived and prospered through the stormy times. The first eight months of the new management saw very little income, with the result that a debt was incurred which we have had to carry along, and which we have

* Address delivered at the Thirteenth Annual Session of the American Congress of Physical Therapy, Philadelphia, September 10, 1934.

been able to reduce only by small amounts. The irregular and curtailed income from dues during these bad years has largely contributed to the circumstance that we are still carrying a good part of this debt on our books.

The Congress has, however, gained steadily during the years of depression. The membership roll has kept up well, but not to the point which it should. The subscription list to the ARCHIVES has constantly increased. The advertisers in the ARCHIVES are a fair representation of the leading companies interested in the progress of physical therapy from more than just a commercial standpoint. Do not, however, conclude that the advertising in the ARCHIVES is top-heavy and that your officers are having a pleasant and easy time in paying the printing bills. This is not the case, for which reason this subject is presented. We need increased cooperation of our entire membership in influencing manufacturers to support the ARCHIVES in every way possible.

The Central Office

Much of the progress which the Congress enjoyed after the 1926 session, was due in no small measure to the establishment of a central office in Chicago with a full time executive secretary in charge. The amount of work carried on in this office is almost unbelievable. The work includes every form of correspondence with nearly every country in the world. Just to give you an idea of what the functions of the central office are, I am enumerating some of them: (1) Editorial writings for the ARCHIVES; (2) correction and revision of manuscripts for publication; (3) reading and correction of proofs; (4) maintenance of correct mailing list for subscriptions and for other purposes; (5) correspondence with advertisers and prospective advertisers; (6) preparation of programs for annual sessions; (7) propagandizing and advertising the spring and annual meetings; (8) collection of dues; (9) collection of advertising accounts; (10) sale of exhibition space and collection of rentals; (11) review of many medical publications; (12) close contact with the Council on Physical Therapy and with other committees, individuals and bodies who are dealing with physical therapy problems, etc., etc.

Amalgamation of the Congress and the American Physical Therapy Association

One of the outstanding and noteworthy achievements, so far as the future of physical therapy on the American continent is con-

cerned, was the consolidation, two years ago, of the Congress and the American Physical Therapy Association. The interests, purposes and general conduct of both organizations being practically identical, the trend of the times definitely pointed to the desirability of a single organization in the specialty. The Congress now is the representative body in the field, its membership consisting of the most active and progressive physicians interested in the "newer therapy." As a result of the joining of forces, much duplication of effort is avoided, a great deal of money saved through the publication of one journal instead of two, a much desired economy achieved for the members who now find it more practical to attend one annual session instead of two, and to pay dues to one organization instead of to three or four constituent bodies apart from a national organization.

The union of the two societies also tended to increase that warm fellowship which has always dominated the Congress, and which now bids fair to continue in a greater degree than ever.

Affiliated Groups

The affiliations of the Pacific Physical Therapy Association, and of the New York Physical Therapy Society with the Congress have greatly added to the strength of the central body. While many of the members of these societies already were affiliated with the Congress, the value of adding these organized units is quite obvious.

Mid-year Sectional Meetings

One of the progressive moves which the Congress has made during the past two years, and one, which, in my opinion, has increased sectional interest in physical therapy is the spring meeting. During 1933 and 1934 spring gatherings have been conducted in the far west, in the mid-western section and in the east. Informative programs have been presented, in each instance carrying the names of men who are leaders not only in the physical therapy field, but also in general medicine. The fact that medical schools have lent their buildings and cooperation for the conduct of these sectional meetings speaks well for the high standing of the Congress as a medical body and the esteem in which it is held by the profession. Unfortunately, activity in the southern section has been lagging, and no spring meetings have as yet been held in that part of the country.

Gold Key Awards

Among the other moves which the Congress has made in the past few years, I draw your attention to the Gold Key awards for outstanding achievements in the newer science. It is indeed fitting that our association should take cognizance of scientific advances, recognize the contributors of original work, and reward those who in the past have actually added to the sum total of our knowledge in subjects of interest to us. This recognition by the Congress of scientific attainment should inspire the younger men in the work and act as an incentive to all who are interested in the development of the medical sciences.

Exhibits

I call your attention also to the subject of scientific exhibits. For several years an effort has been made to provide such exhibits at the annual meetings, but it was not until this year that a sufficient number indicated their willingness to take part. While the present series is not large, it is a good beginning, and one from which there should be a fruitful growth from now on. Fellows are urged to take an interest in this feature of the annual sessions and to plan ahead so that a larger representation will take an active part next year and the years to follow. You are strongly urged to visit and inspect not only the scientific, but also the technical exhibits. I have been repeatedly told by members attending these annual sessions that they acquire much technical information from their visits with the commercial exhibitors. This is undoubtedly true. It should suggest to those who have overlooked this part of the convention to allot a certain part of their time during the week to a discerning visit of every booth.

In recognition of the efforts put forth by those who participate in the scientific exhibits, the Congress offers awards for the outstanding exhibits.

Scientific Sections

It may seem superfluous to allude to the scientific sections of our annual meetings, but there are several important features about them which merit your appreciation. It was of course natural that the wide scope of physical therapy, affecting nearly every specialty in medicine, should require the corresponding division of our labors. Thus the sections on diseases of the eye, ear, nose, and throat, colonic therapy, and so on had to be created to satisfy special interests. The situation is some-

what different concerning our surgical section. Availing ourselves of the fairly widespread interest in electrosurgical technic, the Congress provided a prominent part of the program to further and develop this legitimate method of operative medicine. As a result we have in our membership a number of prominent surgeons who have only an incidental interest in the problems of physical therapy proper. When one considers the great value of electrosurgery in malignant affections and its increasingly large indications for a number of classic operations, we point with pride to the fact that our organization is the only one in the United States which affords surgeons an opportunity to exchange their experience and to develop electrosurgical methods as a recognized and effective part of general surgery.

Educational Aspects

I shall now pass to the educational aspects of physical therapy with which the Congress has dealt during the past several years. The Congress has always considered it important to concern itself with the teaching of physical therapy, not only among its own group, but in the medical schools and for the training of technicians. In the earlier years, part of each annual program was devoted to instruction classes and efforts were made to teach fundamentals. With the gradual development of departments in many of the medical schools and in some of the larger hospitals, these beginners' classes became superfluous and they have therefore been omitted from the program of more recent years. The Congress has no desire to take on the duties of teaching institutions, nor does it wish to engage in argumentative propaganda regarding the merits of physical therapy. The Council on Education of the American Medical Association has set up certain suggestions regarding the subject of physical therapy instruction and the Congress believes these are well balanced and should be followed closely.

One of the problems to be worked out at this session deals with the proper organization of physical therapy technicians. There is a definite need for some systematic plan of their registration, the setting of standards by physicians and not by the technicians themselves, and a careful, fair and practical regulation of other problems involving the relationship of physician and non-medical aid.

Recommendations

In conclusion I beg to submit the following suggestions and recommendations for the future. First, I wish to impress the necessity of increasing our membership roll. If every member will guarantee one new application during the year, our membership would be doubled in that comparatively brief period. We have found that the most opportune time to acquire new applications is during the annual conventions. We have not gained the numbers we should now have, because we invariably neglect to approach this important subject in an organized manner. I suggest, therefore, that the president appoint a committee of five whose duty it shall be to make a concerted solicitation before the beginning of each and every morning and afternoon session during the four days of this meeting. We must add at least one hundred new members at this convention and we can easily accomplish this by a systematic effort.

My second suggestion has to do with the acquisition of new subscribers for the ARCHIVES. You all will agree that the Congress is the proud possessor of the leading publication in the field. You need make no apologies for it. It is a simple matter, if a physician does not want to join the Congress, to have him sign up for a subscription to our official journal. Try it. The reason you have not succeeded in the past is because you haven't tried.

As a third suggestion, I wish to impress upon every member the desirability of owning a membership certificate. The Congress offers appropriate certificates, framed and ready for hanging for a nominal price. A certificate on your office wall will add to your prestige and to that of the Congress. It is a message to the world—and a proud message indeed.

As a fourth suggestion, I desire to impress upon you the importance of "spreading the gospel of physical therapy." How can you do this? It is extremely simple. You are all members of county medical societies. Confer with the secretary regarding a program dealing with physical therapy. If you are in need of participants for such programs get in touch with the central office and we will secure for you authoritative speakers available in your immediate vicinity or even from a distance. It is pitiful to note that during the past years only a few county medical meetings were devoted to physical therapy subjects. Let us all

cooperate and arrange for such meetings during the coming year. We at the central office will appreciate hearing of them in order that a complete report may be submitted to you next year.

My fifth suggestion concerns the organization of state or sectional groups. The ultimate goal of the Congress is to act as a central body for local or smaller bodies. If there is any prospect of organizing a state or sectional society in your community, take an active part in such an organization. The nucleus need not be large to commence with, but it will grow as time goes on and develop into an influential body. Affiliation with the Congress can be arranged for support and prestige. The Congress will lend every help. The chair should appoint a committee on extension whose duties it should be to take an active part in the formation of sectional and state groups.

In conclusion, let me say that this year's program has been prepared with a great deal of effort and certainly with every possible care. You can readily appreciate the high standard we have set. Each year an attempt is made to improve on the program of the preceding year. Your program chairman has always welcomed suggestions, and he certainly will appreciate any which will make our annual programs more interesting, instructive, and attractive.

I express my appreciation to the officers of the Congress, the editor of the ARCHIVES, the executive secretary and the local Convention Committee on arrangements, who have aided me in every way possible to render this 1934 session a success. As the work entailed in the operations of the Congress during the past ten years have greatly added to my daily duties, I could not have carried on, had not this work given me a certain satisfaction. This satisfaction is found in the progress and in the success which the Congress has made, and my only regret is that the success was not much greater. I presume I should offer an abili, and the usual one is the depression. I foresee for the Congress a great future. The next decade will be an eventful one for physical therapy which is beginning to come into its own. With the foundation firmly laid, the Congress is destined to be one of the most prominent and influential scientific bodies in the medical profession.

ARCHIVES of PHYSICAL THERAPY, X-RAY, RADIUM

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EDITORIALS

COURSE OF INSTRUCTION AT KANSAS CITY

We again invite the attention of our readers and through them that of other interested parties to the course of instruction offered by the Congress preceding its next annual session at Kansas City. The value of this special course suggests itself from the list of subjects to be expounded during the three-day seminar. The designation of seminar is appropriate, for every participant will be afforded an opportunity to ask questions and to obtain whatever special details one may feel necessary to elucidate desired information. In this respect the course differs from the set papers and their discussions that will be read before the session, to which the participants in the classes will have access. The men who have been selected to provide the instruction need no other recommendation than that they are thoroughly familiar with the many problems and difficulties that arise in daily practice and that they will adapt their teachings to matters of practical interest. In other words, no attempt will be made to burden the course with abstruse theories or experimental studies but only the concrete and practical will receive full attention. It is only during the luncheon hours that a round table discussion of more

or less general interest has been added as a feature to the instructional program.

We take the standpoint that Physical Therapy is not a specialty in a class by itself but part and parcel of general medicine and surgery. Under such a concept it is clear that the legitimate application of physical therapeutic methods presupposes a thorough familiarity not only with their technics in general but with their indications, dosage, therapeutic effectiveness not only for specific diseases but for patients as human beings with varying characteristics and predispositions. It is with these facts in view that the instruction course will be a seminar in the fullest sense of the word.

We also invite attention to the fact that while the course is intended primarily for physicians desiring to obtain a solid grounding in the subjects to be taught, registration for it is open also to ethical technicians. It will be to the interest of physicians to urge their technicians to take the course because they will secure a better grasp on basic principles and many fundamentals and return to their duties as real helpers and collaborators and not as mere routinists in an inelastic field of work.

UROLOGIC ELECTROSURGERY

It redounds to their credit that American urologic surgeons were the first to avail themselves of the high frequency current for surgical therapy. It was twenty-five years ago that Beer made use of a high frequency apparatus to destroy papilloma of the bladder intravesically by way of the urethral canal. This method found many followers among progressive urologists. From that modest and limited beginning urologists at present have not only kept abreast in the field of electrosurgery with general surgeons but to a certain extent even excelled them. When one recalls the primitive and cumbersome "machines" available to urologic surgeons at a time when general surgeons as a class saw no reason for the employment of the high frequency current in their practice, and when one further considers the fact that electrosurgery is practiced by a comparatively small group of progressive surgeons to this very day when in urology electrosurgery has gained an importance second only to classic surgery, one may well pause and reflect how all this came about. As Harrison⁽¹⁾ aptly points out, the difference between the general practitioner and the specialist is to be found in the instruments used by the latter. In no specialty is this more true than in urology. One need only regard the advances made in cystoscopy to appreciate that without the art of the instrument maker the profession could not enjoy the benefits of tracheo-bronchoscopy, esophagoscopy, and gastroscopy, all of which are carried out with modifications of the present-day cystoscope. And general as well as special electrosurgery could not have been developed to its present day perfection of technics without suitable high frequency apparatus providing controllable electrosurgical currents. So far as urologic surgery is concerned intravesical transurethral surgery was developed to an unthought of degree only since the electric industry provided an electrosurgical apparatus that can be brought into play under water. It was this addition to the urologic armamentarium that made possible the operation which by common consent has been designated as transurethral resection.

Of all electrosurgical problems in urology that of transurethral resection has become one of the most widely agitated. This is easily understood because both perineal and suprapubic prostatectomy are formidable opera-

tions. Their risk is increased through the fact that one is concerned with elderly men who suffer from urinary infection before coming to operation, at least in the overwhelming majority of instances. The history of urology is replete with methods intended to substitute less risky procedures, and while all that may be grouped under the term "prostatotomy" could not become popular owing to inherent disadvantages, transurethral resection has been hailed by some as the final solution of the prostatic problem while others maintain an ultra-conservative attitude towards the procedure. The enthusiasts now claim that their old concept, that transurethral resection is merely an improvement over the original Bottini method of cauterizing a passage for the urinary outflow has already been modified. Resection has done more than restoring physiologic drainage in the sense of so benefiting the hypertrophied prostate as to produce a cure. This contention has not found general acceptance. A number of urologists now claim that resection even in skilled hands is not a harmless procedure and is incapable of accomplishing more than symptomatic relief. And so the many contributions to this problem, a number of which have been presented at recent sessions of the Congress, show a variety of opinions ranging from one extreme of the pendulum to the other. Under the circumstances it is well to bear in mind that critical experience already points to the fact that there are definite indications but also contraindications for transurethral resection of the prostate. Rolnick⁽²⁾ presented a critical analysis of clinical experience which appears to indicate a certain conservatism likely to be followed in the future.

Transurethral resection of the prostate is not the only electrosurgical procedure of interest to urologists. Study of Harrison's⁽¹⁾ article in this issue shows the extent of usefulness of the high frequency current in urologic affections. In the main the indications for the use of electrosurgery in urology tally with the general principles underlying general electrosurgery, the problems of which are discussed in another editorial. The characteristics of the high frequency current lending themselves to electrodissection, electrocoagulation and electrodesiccation naturally are as applicable to lesions of the genito-urinary tract as to those elsewhere in the body. This holds good not only for accessible lesions but for

those made accessible after surgical exposure of the kidneys, ureters and bladder. While general and urologic surgeons are prone to go their own ways in many problems, it is clear that so far as electrosurgery is concerned both groups of workers have common interests which can be advanced by an exchange of experiences.

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CALIFORNIA AND PHYSICAL THERAPY

That the sectional meetings of our Congress have become recognized as one of the most substantial ventures for the promulgation of scientific physical therapy throughout the land is indicated by the recognition and wholehearted support given them by outstanding universities and medical bodies. The growing attendance and the interest manifested in these sessions has largely been due to well formulated programs in keeping with the best traditions and advances of scientific medicine. This year's sessions of the eastern and mid-western sections are already of historic interest, both having been held under the wing of two of America's outstanding universities, the Johns Hopkins at Baltimore, and the University of Wisconsin at Madison. On the Pacific Coast the Los Angeles County Medical Society has been the sponsor of the last two sessions of the western section, an act which required courageous faith not only in the fundamental values of physical therapy but in the group of physicians who were especially interested in its scientific exploitation. The extraordinary success of these two meetings must undoubtedly be attributed to support lent it by organized medicine in general and to the sturdy leadership of such men as Toland, Wilson, Hibben and others,—men of courage, vision and faith to whom all credit is due for the increasing recognition of things orthodox against things heterodox in connection with the chaotic situation of physical therapy on our southern littoral of the Pacific.

It goes without saying that no other state

in our Union is so richly endowed with all of nature's blessings as is California. Its soil, climate and vegetation are the most extreme and fecund. Growth is both profligate, miserly and variegated. Everlasting snow is on high and the products of tropical growths cover the low levels. One feels and sees every benediction and repression of nature — mountains, deserts, exotic blooms, towering trees and stunted shrubs — a legitimate setting for expressions in grandeur or for the artificialities depicted by the canned emotions of the movies, an offspring of mass psychology in the ferment of adjustment. Intellectually California is blessed in majestic overtones and in confused nethertones. It reflects the best and the most questionable in every field of endeavor. It has been the El Dorado and the Mecca of sturdy pioneers, idealists, dreamers and racketeers.

No other state can boast of more glorious seats of learning, more extraordinary institutions for the treatment of the sick, more natural springs and beautiful sanitariums for the care of the invalid, nor more amazing varieties of practices for filching from a more gullible public the honest coin of the realm for exchange of less than proven remedies. Is it then to be wondered at that scientific medicine in California in defense of its recognized prerogatives has looked with suspicion upon any method new or established that has not had general acceptance and universal recognition from the very top of the profession? No other state is at present more in need of virile leadership and courageous guidance in physical medicine than beloved California. The task is colossal in aspect, for no other section of the country is so overrun with every conceivable pathy, ism as is she. Jostled and sniped at by all forms of practices, organized medicine must realize that physical therapy has borne the brunt of unethical practices and has stood in defense of scientific practice for the benefit of legitimate medicine. It deserves full support and official recognition from the best sources in that state so that it will be more scientifically exploited by those most competent in the profession.

It is heartening to realize that no one more fully appreciates the nature and difficulty of this problem than the very leaders and educators of medicine in California. Their foresight has been responsible for the creation of a state committee on physical therapy with

Hibben as Chairman, the teaching of this discipline at Leland Stanford under one of the recognized authorities in the country, Langnecker, and at the University of California under Baker. The most significant and encouraging promise that a solution of this depressing and difficult problem will soon obtain the needed support and leadership from the most desirable quarters is the fact that this very problem is now receiving the active sympathy and consideration from such distinguished members of the profession as Dean Chandler, Bloomfield and others of the medical faculty of Leland Stanford University, and from equally representative individuals in other sections of the Pacific coast. If nothing more had been accomplished than the awakening of the active interest of these leaders towards their responsibility in controlling the scope, practice and education of physical therapy, the recent meeting of the western section held at Los Angeles was perhaps the most pronounced success. Organized medicine has much to gain from unselfish leadership such as it has in abundance in California, a State bountiful in all things.

Arthur H. Ring

The many friends and admirers of Dr. Arthur H. Ring will be grieved to read of the untimely death of this leader and physician of modern physical therapy. Dr. Ring died on June 25th from coronary thrombosis. He was Secretary of the Academy of Physical Medicine and of the New England Physical Therapy Society. The officers and members of the Congress offer deepest condolence to his family.

Frederick C. Caverly

The Congress wishes to announce the passing of one of its members, Dr. Frederick S. Caverly of Clifton, New Jersey, on May 15. Dr. Caverly was also a member of the New York Physical Therapy Society.

Axel Reyn

It is with profound regret that we chronicle the recent, premature death of our highly esteemed foreign collaborator, Dr. Axel Reyn, of Copenhagen. Dr. Reyn was not only the Director but the scientific leader of the internationally famous Finsen Institute of that city. While Finsen's name has gone down in the history of medicine as that of one of the greatest pioneers and pathfinders in the domain of phototherapy, his successor's name will have an equally distinguished place among the men who have aided in the advancement of this specialistic field. Axel Reyn has indeed raised the physics and biologic effects of light therapy to a high standard through his utmost devotion to and profound research in phototherapy.

Dr. Reyn has taken a deep interest in the American Congress of Physical Therapy and its official publication, the ARCHIVES. It will be recalled that not so many years ago he crossed the ocean to address the medical profession of the United States. His work attracted serious attention not only for its erudition but for its underlying research along paths which then had not been widely known.

The officers of the Congress and the editorial staff of the ARCHIVES extend to the Government, the people and especially the medical profession of Denmark their sincere condolence in the loss of their illustrious citizen and savant whose efforts in behalf of suffering humanity will be missed throughout the civilized world.

SCIENCE, NEWS, COMMENTS

Pacific Physical Therapy Association Elects New Officers

The new officers for the Pacific Physical Therapy Association for 1935-1936 are as follows: *President*, Cora Smith King, M.D., Hollywood; *Vice-President*, Cleon W. Symonds, M.D., Pasadena; *Secretary and Treasurer*, Fred B. Moor, M.D., Loma Linda, California.

Mississippi Valley Medical Society

The first annual meeting of the newly formed Mississippi Valley Medical Society will be held at the Lincoln-Douglas Hotel, Quincy, Illinois, on October 2-3-4, 1935. A most practical program of intensive post-graduate instruction by eminent clinicians has been arranged. A preliminary program may be obtained from the Secretary, Harold Swanberg, M.D., 211-224 W. C. U. Building, Quincy, Illinois.

Influenza Cases Increase Throughout the Country

Influenza cases throughout the country increased from 2,889 to 4,965 during the first week of the new year, reports of 38 state health officers to the U. S. Public Health Service show.

These official reports do not give a true picture of the influenza situation, public health officials point out. Actually there may be 49,000 or more cases of the disease. The reported number of cases must be multiplied by five or ten or more in order to get anything like a true idea of the amount of influenza present in the country, since so very many cases of this disease never get reported, even during epidemics.

Confusion of influenza with colds and gripe adds to the difficulty of determining the amount of influenza in the country. Influenza is a much more severe ailment than gripe, while the latter is more severe than the common cold, health officials in Washington, D. C., explain.

Another fact that makes it difficult for health officials to size up the influenza situation is that this disease is not officially reported in three very populous states — Massachusetts, New York and Pennsylvania. — *Science News Letter*, January 19, 1935.

Tuberculosis Test Material Isolated in Pure Crystals

A great advance in medicine's warfare on the great white plague, the obtaining of tuberculosis test material in pure crystals, has just been made by Dr. Florence Seibert of the Henry Phipps Institute, Philadelphia.

For 60 years scientists have been endeavoring to isolate in pure form this substance of the tuberculosis bacillus. It, like tuberculin, allows the making of a simple skin test to tell whether or not a person or animal has tuberculosis. The new purified substance will be of immediate application to human patients.

Scientists have known for 60 years that this substance was there in TB "germ" and they have been using it in tuberculin tests on man in vast programs of tuberculosis eradication in cattle to insure a safe milk supply. But it has never before been available in pure form.

The isolation of this new substance, called the purified protein derivative of the tubercle bacillus, may be likened to getting out of the pancreas pure crystalline insulin for treating diabetes. Using the old tuberculin would be like using a preparation of the whole pancreas to treat diabetes. The insulin would be there but so would many other substances. Old tuberculin contained the tuberculosis detective, but it also contained many other things.

To produce this important protein substance, tubercle bacilli were grown on an inorganic medium and by special chemical methods the pure crystalline substance was isolated. Dr. Seibert has reported technical details of the isolation in the *American Review of Tuberculosis* (Dec.). Her work was done under the auspices of the medical research committee of the National Tuberculosis Association, largely supported by Christmas seal sales. — *Science News Letter*, December 15, 1934.

Correction

The Editor acknowledges the following errors in the article "The Scotch Douche" which appeared in June, 1935, issue of the ARCHIVES: Page 332 — 3rd line under Table 1, should read: "... the rate at Pr_2 was 10.3 per cent higher than at Pr_1 . . ."; Page 335 under Fig. 3, 7th line, should read: "... was about (—1 per cent), . . ."; 9th line, should read: "... ($Pr_2 \rightarrow Po_1$) . . ."; 13th line, should read: "... ($Pr_2 \rightarrow Po_1$) . . ."; Page 338, 1st column, 5th line, should read: "... extrinsic agency . . ."

Giant X-Ray Tube Proving Its Worth in Cancer Cases

First reports of the results of treating cancer by powerful gamma rays from the giant 900,000 volt x-ray tube of the California Institute of Technology have been made by Dr. Albert Soiland, chief of the Soiland Clinic, Los Angeles.

"Encouraging" and "hopeful" are the words Dr. Soiland used in describing the results obtained with patients suffering from advanced cancer. Before the five-year treatment period is over, Dr. Soiland and associates feel, as do all scientific cancer workers, no definite conclusions can be drawn. No statistics of scientific value can be established before this period has passed, he stated in a report to the Oklahoma City Clinical Society.

For the past four years, however, a group of advanced cancer patients have been undergoing treatment at the institute in Pasadena where the giant tube is housed and at Dr. Soiland's clinic where there is now a similar tube.

"We have seen results in a few advanced patients with cancer which had not yielded to treatment with our lower voltages," is Dr. Soiland's conservative way of reporting the results of the first four years' work.

The shorter wavelengths of the rays from the big tube permit more of them to penetrate to the deeper layers of the body, he explained. This accounts for the following three distinct advantages over treatment by lower voltages: The period required for treatment is shorter; there is less skin irritation; and unpleasant stomach sensations are largely avoided. — *Science News Letter*, December 8, 1934.

The Virus of Influenza Identified by Serum Tests

Serum tests that identify "quite definitely" the virus causing human influenza and show the same virus is the cause of the disease in different parts of the world were reported by Drs. Thomas Francis, Jr., and T. P. Magill of the Rockefeller Institute for Medical Research, to the American Society for Clinical Investigation.

The virus was obtained from throats of influenza patients in Puerto Rico, New York and Philadelphia. The virus can be transmitted to both ferrets and mice, and in both species of animals causes consolidation of the lungs. Most of the mice die of the disease, but the ferrets usually recover.

The blood serum of ferrets that have recovered can check the ability of the virus to infect mice and to produce the lung consolidation. So does the blood serum of convalescent influenza patients, but the serum taken from patients during their acute illness does not protect the mice against the disease. This latter finding, Drs. Francis and Magill state, seems to "show quite definitely that the virus is the causative agent of the human disease." — *Science News Letter*, May 18, 1935.

Electric Currents Picked Up From Head Show Brain Action

Brain waves, electrical impulses accompanying brain activity, promise to allow physicians to probe harmlessly into the brain processes of healthy and ill patients in much the same way that heart function is now extensively charted in the familiar electrocardiographs.

The tapping for medicine of the electrical messages from the brain comes as the culmination of long years of research on the physiology of the brain and particularly the character of the electricity within the skull.

The latest work is by Drs. H. H. Jasper and Leonard Carmichael of the psychological laboratory of Bradley Hospital and Brown University, who followed up and confirmed in many particulars the researches of Dr. Hans Berger of Jena. The German scientist found that the changes in electrical potential connected with human brain activity may be magnified by running them through a vacuum-tube amplifying system similar to that used in radios and then using the enhanced current to operate an oscillograph which writes in light on a photograph a wavy line corresponding to the fluctuations of the electricity in the brain.

Drs. Jasper and Carmichael reported their findings in an article titled "Electrical Potentials from the Intact Human Brain."

"Electroencephalograms" the wavy line records of brain action are called, corresponding to electrocardiograms, which is the term applied to the familiar and similar records of heart actions.

Drs. Jasper and Carmichael declare that electroencephalograms may well "prove significant in psychology and clinical neurology."

It is not necessary to penetrate within the head to obtain the brain current records, although in some of Dr. Berger's earlier work it was thought necessary to insert needle electrodes through the skin. The patient simply wears on his head next to the skin some harmless pieces of metal that act as electrodes to pick up, without any sensation on the part of the patient, the brain currents.

Two kinds of brain waves were detected by Dr. Berger. The biggest waves Dr. Berger called alpha waves, giving to the smaller ones the name of beta waves. The alpha waves, Dr. Berger found, became smaller when the patient was under certain types of anesthetic, during an epileptic seizure, and when the person being studied did a "mental" problem or had his senses stimulated. The waves are their largest when the person is relaxed.

Alpha and beta waves were also detected by Drs. Jasper and Carmichael. In addition they found another type of wave which appeared when the subject's senses were stimulated by light or sound. Further experiments may show that waves of this type are irritation or stimulation waves.

The frequency of the alpha waves does not vary much from day to day in the same person, the investigators found. In one or two cases

of illness, the frequency of these waves was very low.

Some normal persons, and especially sick persons, show different frequencies or lack of synchronism between the functioning of one side of the brain and that of the other. One girl, who was subject to "fits" or convulsions and who was quite ambidextrous, had an alpha-wave frequency of ten per second on the left side of her head and of but six to eight across the right side.

Others who have worked on these brain phenomena include Dr. E. D. Adrian, the British scientist who shared the 1932 Nobel prize in medicine. Working with Dr. B. H. C. Mathews, he found the waves in the brains of rabbits, while Dr. Prawdycz Neminski as early as 1925 found similar action potentials in dog brains.

Dr. Berger's work showed that there is no direct relationship between the brain waves and the pulse, and that even a momentary arrest of both breathing and heart beat has no marked effect on the brain potentials. — *Science News Letter*, January 19, 1935.

Infantile Paralysis Vaccine Ready for Next Epidemic

More than 300 children have been successfully vaccinated against infantile paralysis — poliomyelitis to scientists — and thus assured that they will be saved from the deformities and crippling effects of this dread disease, it was revealed to the American Association for the Advancement of Science.

Two of America's leading disease fighters now concentrating their efforts on this disease, Dr. Maurice Brodie of New York University, Bellevue Hospital and New York City Health Department, and Prof. John A. Kolmer of Philadelphia's Temple University, reported encouraging progress.

And in California, considered an epidemic area for the disease, Dr. Brodie's vaccine is being given "final proof" through the vaccination by Dr. Joe Smith, Kern County health officer, of hundreds of children and adults who have been in contact with the disease. No child had any untoward effect from the vaccine. Vaccinations are continuing.

Dr. Kolmer has used his vaccine on 25 children, among them his two sons, John and David. Both Drs. Brodie and Kolmer tried the new protective first on monkeys, then on themselves and then on fellow medical workers, six in New York and two in Philadelphia, before children were vaccinated.

Not in agreement with Drs. Brodie and Kolmer was Dr. W. Lloyd Aycock of Harvard who considers that protective vaccination is not a practical method of control. A very large part of the population become immune to the disease by the time they are grown-up and because of this relatively few contract the disease, Dr. Aycock told the scientists.

Dr. Kolmer disagreed: "Certainly I cannot agree with those who believe that the processes

of natural immunization, whatever they may be, are sufficient since so many, especially children, contract the disease before such immunity can develop and either succumb or recover badly crippled and handicapped for the balance of life."

The Brodie and Kolmer vaccines are not exactly the same but both consist of the virus or invisible germs of the disease so weakened, attenuated or inactivated by chemicals that instead of producing the sickness they stir up the body to produce the anti-body "soldiers" in the blood to fight later invasion of the infective agents. Dr. Brodie uses formalin and Dr. Kolmer uses sodium ricinoleate made from castor oil beans.

Not yet are these polio vaccines ready for widespread use by physicians, and it will take several years to tell whether the protection conferred is sufficiently lasting to justify their routine use. But Dr. Kolmer's monkeys have stayed immune for a year, whereas the injections of blood from normal healthy adults during some recent epidemics in hope of conferring protection are known to be of short usefulness.

Thanks to advanced methods of therapy practiced at such places as Warm Springs Foundation founded by President Roosevelt for other poliomyelitis sufferers, the chances of recovery from infantile paralysis are now brighter. Through the vaccines being developed there is the chance that little children may be saved from poliomyelitis and that this disease will join smallpox, diphtheria, typhoid and other conquered diseases. — *Science News Letter*, January 5, 1935.

Rickets in Rats May Be Cured by Phosphorus

Rickets in rats was cured simply by adding the bone-building element, phosphorus, to the animals' diet, Drs. C. A. Lilly, C. B. Pierce and R. L. Grant of the University of Michigan Medical School reported (*Journal of Nutrition*, January).

The experiment shows definitely the place of phosphorus in the treatment of rickets, the investigators believe.

"Rickets in young rats is identical with rickets in children," Dr. Lilly stated in commenting on the possible human application of the studies.

The rats were fed on a rickets-producing diet and kept in a dark room, away from the rickets-preventing ultraviolet light of sunshine, until definite symptoms of the disease appeared. They were then divided into three groups.

One group was kept on the rickets-producing diet, with the result that the condition continued. Another group was given the same diet with the addition of a definite amount of viosterol, which is known to be a cure for rickets. The third group received the old diet plus a phosphorus ration. Both of the last two groups showed healing of the rickets within thirty days. Microscopic, chemical and x-ray examinations showed that the rats receiving the phosphorus improved as much as those receiving the viosterol. — *Science News Letter*, February 9, 1935.

THE STUDENT'S LIBRARY

THE MANAGEMENT OF FRACTURES, DISLOCATIONS AND SPRAINS. By *John Albert Key*, B.S., M.D., Clinical Professor of Orthopedic Surgery, Washington University School of Medicine; Associate Surgeon, Barnes, Children's and Jewish Hospitals, St. Louis, and *H. Earle Conwell*, M.D., F. A. C. S., Orthopedic Surgeon for the Tennessee Coal, Iron and Railroad Company, Birmingham, Alabama; Orthopedic Services of the Employees' Hospital, Fairfield, Alabama; Member of the Fracture Committee of the American College of Surgeons. Cloth. Price \$15.00. Pp. 1164 with 1165 illustrations. St. Louis: C. V. Mosby Co., 1934.

This volume is a complete and practical working guide in the management of fractures, dislocations and sprains. There are excellent chapters on special fractures. The chapter on skull fractures was written by the late Charles E. Dowman, and fractures of the jaws and related bones of the face have been critically evaluated by James B. Brown of St. Louis. There are special chapters on the workmen's compensation laws and the medicolegal aspects of fractures. An excellent description of the end results of fractures, showing the methods of using Conwell's goniometer has been included. The section on physical therapy advises the average surgeon to adopt a middle ground and to remember that the therapeutic value of physical therapy is largely dependent upon the skill with which it is administered. The authors are qualified by practical experience to write with authority on the diversified subjects material associated with the management of fractures. This book is recommended as a valuable source of information on the treatment of all fractures, dislocations and sprains.

MODERN TREATMENT IN GENERAL PRACTICE. Edited by *Cecil P. G. Wakely*, D.Sc., F. R. C. S., F. R. S. E. Cloth. Price \$4.00. Pp. 426. Baltimore: William Wood and Co., 1934.

This volume contains a collection of papers written for the general practitioner by the specialist, and is intended to concisely set forth the latest progress made in medicine and surgery. Many of these discussions are of practical value to those interested in physical therapy. It is worth noting that, in these articles covering such a wide range of therapeutics, there are two on spa treatment. In the United States this subject is relatively neglected. In the chapter dealing with the practical survey of spa facilities the author states that if the value of spa treatment in the cure or prevention of disease were sufficiently well known, many sudden deaths and many years of suffering and crippledom might be prevented. It is believed that the subject of spa treatment in the United States should be further investigated.

THE INTERNATIONAL MEDICAL ANNUAL. Year Book of Treatment and Practitioner's Index. Editors: *H. Letheby Tidy*, M.A., M.D., Oxon., F.R.C.P.; *A. Rendle Short*, M.D., B.S., B.Sc., F.R.C.S. Cloth. With many plates and illustrations. Pp. 522. Price, \$6.00. Baltimore, William Wood & Company, 1935.

The Medical Annual has for many years recorded the meritorious accomplishments in medical science, paying attention mainly to methods of treatment which can be applied at once to general medical practice, while in other directions, such as in clinical pathology, progress has been summarized. The editors call attention to the fact that it has been the custom of the publishers every ten years to issue an index of the subjects referred to in the Medical Annuals for that period. The last decennial index was published in 1925, covering the years, 1916 to 1934. The Fifth Decennial Index, for the years 1925 to 1934, is now ready. A new feature has been introduced into the present Ten-year Index which should be specially appreciated. The editors of each section have contributed a review of the principal discoveries and advances in each branch of medical science, with references which enable the reader to study the more important subjects in detail. It constitutes as a whole a Ten-Years' Survey of Medicine in all its aspects. The various specialties, both in medicine and in surgery, are adequately represented in the dictionary of practical medicine. While it is, of course, impossible to record every advance included in the literature, there is little of interest or value which has been omitted. The plates are instructive and aid substantially in an understanding of the corresponding reviews presented. It is interesting to note in the index references to diathermy, radium, ultraviolet rays and x-rays. This merely shows that these agencies are now receiving due consideration from a therapeutic standpoint. There are numerous instances when one finds it necessary to ascertain the progress in a certain field of medicine. The work would be time-consuming if the entire year's literature had to be reviewed. In the annual, quick reference on nearly every subject is made extremely simple. This volume and those of preceding years are a valuable addition to any medical library.

THE PRINCIPLES AND PRACTICE OF MEDICINE. Designed for the Use of Practitioners and Students of Medicine. Originally written by the late *Sir William Osler*, B.T., M.D., F.R.S. Twelfth Edition; revision by *Thomas McCrae*, M.D., Fellow of the Royal College of Physicians, London; Professor of Medicine, Jefferson Medical College, Philadelphia; formerly Associate Professor of Medicine, Johns Hopkins University. Cloth. Pp.

1196. Price, \$8.50. New York and London, D. Appleton-Century Company, Inc., 1935.

Those who are familiar with Osler's original work will at once welcome this new edition — a perpetuation of the memory of a great physician, a great medical scholar. Osler's text needs no introduction to the medical profession. It has always stood out as a model, and, doubtless, always will, because of the wealth of material it contains. The numerous revisions are in themselves merely an indication of the manner in which this work has met the approval of physicians and students generally. The present volume is completely reset, a new type is used which permits of more words to the page and which is regarded as being more easily read. Cognizance is taken of the fact that a page which gives the maximum of comfort in being read is particularly desirable in a textbook. And as the reviser views it, there are certain other qualities which a textbook should possess. "One, that it should not be of a size and weight which make it difficult to handle and uncomfortable to hold. The contents should represent what may be regarded as sound, conservative and established knowledge; a textbook is not a year-book and should not be blown about by every wind of doctrine. It is tempting to discuss theories but the place for this is elsewhere." It is quite obvious that every effort has been made in the new revision to include only such material as has permanent value. While even the reviser has appreciated this fact, he has, nevertheless, exercised his best judgment in making changes. An interesting comment on the preface has to do with the study of the patient, in which connection one reads: "Certainly we should keep before ourselves and our students the need of emphasis on the study of the patient as a whole and as a human being, and all the manifestations of disease as shown in him. Too often the idea is held that a clinician can be made over night, especially with the aid of instruments and laboratory procedures. In saying this the value of the aid from these is not made light of but time and effort and hard work must go to the acquiring of a knowledge of disease and the patient in whom it exists. We cannot be Oslers but we can do our best to follow his steps." The many changes and additions in practically every part of this new edition are necessitated by the desire to bring it up-to-date. Any one who peruses the respective chapters will promptly appreciate that the task although not light, has been thoroughly accomplished. Dr. McCrae has demonstrated a keen insight in the requirements of the medical practitioner and student and has exerted an uncanny ability to fulfill these requirements. While many new books on medicine have come from the press in recent years, Osler's is outstanding. It will, of course, be received with enthusiasm as the name, Osler, is indelibly imprinted in the minds of every living doctor of medicine.

THE STORY OF MEDICINE IN THE MIDDLE AGES. By *David Riesman*, M.D., Sc.D., Professor of the History of Medicine and Professor Emeritus of Clinical Medicine, University of Pennsylvania; Member, History of Science Society and Medieval Academy of America. Cloth. Pp. 402 with 79 illustrations. Price, \$5.00. New York: Paul B. Hoeber, Inc., 1935.

The Middle Ages often disparagingly called the Dark Ages have been a neglected page of medical history. This is exemplified by the paucity of good works in the English language dealing with this period. This volume is therefore a welcome contribution, being not only well written but full of information not generally available, containing many excellent pictures taken from ancient sources and the many foot notes tantamount to an excellent bibliography. It thus admirably fills the hiatus between the medical history of ancient Greece and Rome and the twentieth century. Knowledge of the use of physical agents during the whole period of the Middle Ages was limited. It is interesting to observe that the treatment of smallpox with red light which was later used by Finsen, the pioneer of artificial light therapy, was already known to Gilbertus Anglicus (1180-1250), Bernard Gordon, and John of Gaddesden (1280-1361). Peter of Abano (1250-1316), called a second Aristotle, questioned the use of cold water in fevers. Thaddeus of Florence of the same period was considered the most illustrious physician of Italy and in his book on the conservation of health gives sound advice on the value of daily gymnastic exercise. There is an interesting chapter on baths and medieval hygiene. The bathing establishments were the architecturally insignificant successors of the grandiose warm baths or *Thermae* of the Romans. The Crusades which brought many oriental customs into vogue stimulated a great increase in bathing establishments. There is little medieval literature on the hygienic value of baths or on the curative virtues of the thermal baths. The impetus to their use came largely from lay sources, as Montaigne and other individuals. Baths were established in many convents. The establishments were used for bathing, sweating and cupping. Blisters, scarification, and the moxa were favorite topical applications. Scarification was, next to purgation, the most valuable procedure in the treatment of dropsy. Although the additions to medical knowledge during the Middle Ages were not proportionate to the length of this period, credit must be given for the preservation of the writings of the Greeks, Romans, Arabs and Jews, and the founding of the universities. Riesman states that if there were no other contribution of the Middle Ages to civilization, the founding of the universities alone, should insure to them the respect and gratitude of later generations. To those at all interested in medical history this volume is worthwhile, both for reading and for reference.

INTERNATIONAL ABSTRACTS

Influence of Viosterol on Electrocardiogram. **W. Uhse.**

Jahrb. f. kinderheil 144:63, (Feb.) 1935.

Uhse points out that, in addition to the therapeutic effects, viosterol also exerts a toxic influence, and he substantiates this by reviewing the literature and by his own observations. In all, he examined eighty-two children. The first group of twenty-one children had been treated with a viosterol milk of which 0.5 liter contained approximately three drops of standardized viosterol in oil. In all these children the treatment had the desired antirachitic effect, but seventeen of them showed an abnormal electrocardiogram. A second group of sixteen children was treated with viosterol in oil, and all but one showed changes in the electrocardiogram. A third group of twenty children was given cod liver oil with viosterol, and disturbances in the electrocardiogram developed in fifteen. The fourth group of eight children was treated with pure cod liver oil, and seven developed electrocardiographic changes. The fifth group of seventeen children was subjected to quartz lamp irradiations, and these showed no changes in the electrocardiograms at the end of the treatment. The electrocardiographic changes that developed in the first four groups were nearly always in the final wave; that is, in the part that begins with S and ends after T. The question of whether there is a connection between the dosage of viosterol and the pathologic manifestations in the electrocardiogram is answered by the fact that in the author's cases the minimum doses were given and still the changes developed. The electrocardiographic changes that develop following medication with viosterol largely resemble those which develop after infections, such as scarlet fever myocarditis, in which myocarditic foci are present. Thus it appears possible that medication with viosterol may lead to myocardial impairment. However, while most postinfectious electrocardiographic changes are only transitory, those caused by viosterol are still present from six to nine months later. It is worthy of note that the sensitivity to viosterol decreases with the age of the children. The author observed that nurslings and small children who are less than 2 years old are most likely to develop electrocardiographic changes following treatment with viosterol. Older children and adults are less exposed to this danger. Moreover, children with rickets tolerate viosterol better than those without rickets. — [Abst. J. A. M. A. 104:1460 (Apr. 20) 1935.]

Comparison of the Mutation Producing Effect of X-rays and Radium Rays on *Drosophila melanogaster*. (Vergleich der mutations-auslösenden Wirkung von Röntgen- und Radiumstrahlen bei *Drosophila melanogaster*). A. Pickhan.

Strahlentherap. 52:369, 1933.

The paper reviews the results of the radiogenetic investigations on *drosophila melanogaster*. The studies of Hanson-Heys, Oliver, Timoféeff-Ressovsky have demonstrated irreversible changes (mutations) of the genes and chromosomes by short wave rays. These effects are in direct linear proportion with the ionizing effect of the x-rays or radium rays. A wavelength specificity does not exist. According to the American authors, x-rays have a fourfold higher activity than gamma rays. This surprising statement warranted a recheck. A method is developed by which the gamma rays are measured in "r" units and a strict comparison of x and gamma rays is established. Mutation studies were carried out in an x-ray and a gamma ray series, in both cases 3 different energies of the rays being used. Both series proved the proportionality of dose and mutation rate. No quantitative difference occurred between the effect of x-rays and gamma rays. In both cases the Bunsen Roscoe law ($I, t = K$) holds strictly true. A comparison of the relative figures of lethal and nonlethal mutations indicates that the effects caused by x and gamma rays are qualitatively identical. A critical discussion of the comparative value of experiments conducted on insects and mammals leads to eugenic consequences and postulates as to the practical medical use of x-ray and radium rays.

The Permeability of the Human Skin to Radium Emanation in an Air Chamber. (Über die Permeabilität der Menschlichen Haut für Radimenanatron im Luftbad.) G. Lang.

Strahlentherap. 52:187, 1935.

The permeability of the human skin for radium emanation is studied. The subject is placed in an air tight chamber which contains a measured amount of radium emanation, but inspires only air free of radium emanation. The expired air is collected and is found to contain radium emanation. It is shown that the gas penetrates the skin, but is rapidly expired through the lungs.

Ionization — Circuit Plans for an Inexpensive Unit. Douglas Macfarlan.

Arch. Otolaryng. 21:456 (April) 1935.

A definition of ionization is given. In practice, according to the author, the methods are like those of electroplating. The essential requisites for carrying out the procedure for the ear are described. The technic is given and a diagram shown of an inexpensive ionization unit.

The author believes that ionization is useful in the treatment of many simple cases of chronically discharging ears. The discharge will cease with this method when other methods have failed. It is well to use the other methods on a series of controls or on the patients before treatment with ionization before forming an opinion of the value of the ionization method. The indications are cited. After mastoiditis with a continuance of the discharge ionization is recommended. There should, however, be no attempt to substitute ionization for operation on the mastoid in acute or chronic cases or in cases in which the condition clears up with each ionization treatment but recurs. Ionization should be looked on as a valuable adjuvant method to a rational series of procedures for use in cases of otitis media purulenta.

The author does not know how zinc ionization works. It is questionable, in his opinion, if solutions of other heavy metals do not work as well. Zinc sulphate alone may do the work, but this is improbable as many and better bactericides have been tried with equally mediocre success. Those who are fatigued with treating patients with persistently discharging ears will find more than occasional satisfactory results in the use of ionization. The method is innocent, and if care is taken there should be no electric shock.

Spectrophotometric Studies on Normal, Erythematous and Pigmented Human Skin. (Über spektralphotometrische Untersuchungen an menschlicher Haut unter besonderer Berücksichtigung des Erythem- und Pigmentierungs-Messung.) H. G. Bode.

Strahlentherap. 51:81, 1934.

A systematic study of the reflexion of light by the human skin reveals that the spectral reflexion curve has two maxima at 500 and 630, separated by an area of minimal reflexion around 550 m μ . The maximum in the red region is stronger than the one in the green, a fact which explains the pink shade of normal skin. In erythematous skin the intensity of the green maximum is reduced, while the red maximum is unaffected. The reddening of the skin is determined by the ratio of the two intensities. The pigmentation is produced by the lowering of both maxima. The simplicity of these facts and measurements permits an easy quantitative determination of the color of normal skin and the degree of erythema and pigmentation.

X-Ray Therapy of Blood Diseases (Röntgentherapie der Blutkrankheiten). R. Rape.

Wien. klin. Wchnschr. 47:1459 (Nov.) 1934.

The x-ray treatment of polyglobulia up till now consisted of intensive irradiation of the medulla of bones by fields. Following Sgalitzer's suggestion general irradiation in cases of polyglobulia has been carried out with favorable results. The advantage of this method lies in the small dosage which may be repeated as often as needed to attain success. Control of the blood picture after every fifth exposure is essential and attention should be paid to the shape of the leucocytes. Decrease of the white blood cells dictates interruption of the treatment. In the beginning each particular dosage was noted with 30 r. In persistent cases the author raised it up to 90 r. for one exposure without intensive general symptoms appearing in consequence. The prognosis of agranulocytosis which previously was hopeless has become encouraging through irradiation. The cases, however, must be treated as early as possible. The author suggests small dosage of general irradiation. Within a few hours improvement may become apparent.

Regarding x-ray treatment of leukemia the author prefers local irradiation of the spleen and perhaps of the liver to the total irradiation recommended by others. For lymphatic leukemia he suggests irradiation also of the lymphatic glands, because it insures more speedy and thorough retrogression of the spleen and of the lymphatic gland enlargement. Treatment must be stopped before obtaining normal leucocytes, experience having shown that the white blood cells will further abate when irradiation is discontinued and that there is a risk of serious diminution in number of white corpuscles when exposures are being continued too long. Insufficient retrogression of splenic enlargement observed frequently in chronic cases, does not justify continuation of x-ray treatment. Every precaution must be used in cases of hemorrhagic diathesis, because the walls of the blood vessels in leukemia patients are extremely vulnerable to damage. Though radiation is at best merely symptomatic treatment, remissions over a period of several years have been observed.

Measurement of the Beta Radiation of Radium in r units. (Messung der Betal-Strahlung des Radiums in r-Einheiten.) H. Smereker and K. Juris.

Strahlentherap. 52:327, 1935.

By use of a small carbon chamber the intensity of the radiation of radium was measured in r units for different distances and different filters. The intensity of the unfiltered beta radiation of 1 mg. radium at 1 cm. equals 1720 r/hr, the gamma radiation under identical conditions amounts to 8.6 r/hr. This shows that the beta radiation of radium is about 200 times as strong as its gamma radiation.

Ionization as a Prolonged Palliative in Vasomotor Rhinitis. A. R. Hollender.

Arch. Otolaryng. 21:448 (April) 1935.

The nature of vasomotor rhinitis is discussed emphasizing the fact that this type of rhinitis is not a disease entity. The nasal condition itself is not a true inflammation but an edema of the membranous tissues characterized by eosinophilic infiltration. Rhinologists must pay more attention to this predominating phenomenon in addition to giving whatever general treatment they deem indicated to influence the underlying constitutional factor or factors. The problem of coexisting infections must be considered. In infections without coexisting vasomotor rhinitis the eosinophil count in the nasal secretions never exceeds one per cent.

From a therapeutic standpoint there is much to be desired, so far as vasomotor rhinitis is concerned. Certainly there is as yet no true curative measure. Theoretically specific immunization is the ideal treatment, but practically it has not afforded the degree of success claimed for it by some enthusiasts. Failures have led to the employment of nonspecific therapy which also has proved none too successful. The numerous forms of nonspecific treatment are cited, consideration in this paper being restricted to intranasal zinc ionization.

While the method has been utilized for some years for chronic rhinitis and some forms of sinusitis, it has recently been given a thorough trial in vasomotor rhinitis. The palliative effects have been so gratifying that rhinologists are justified in availing themselves of the method in order to afford their patients relief for a comparatively long period.

A comparison is made of the various techniques, and a description of the author's stressed because it aims at simplicity. The sources of the galvanic current are mentioned. A new self-retaining zinc electrode, devised by the author, is described primarily because it renders the procedure easier and safer of application. The effects of ionization are pointed out, attention being called to the fact that although all local reactions in many instances do not disappear before a week, subjective improvement is reported by the patient within a few days.

The experience of the author in a recently reported series of cases is given and several representative cases cited. As a result of this study the following conclusions are drawn:

1. It has not been definitely established whether vasomotor rhinitis is a local manifestation of a constitutional allergic state or a symptom of a metabolic, endocrine or nervous disorder.
2. True vasomotor rhinitis masked by infection can be diagnosed by determination of the eosinophils in the nasal secretions.
3. Pathologically, vasomotor rhinitis is not a process of true nasal inflammation but an edema with eosinophilic infiltration.
4. The theoretically rational method of management of vasomotor rhinitis directed to the re-

moval of the recognized allergen and specific immunization has not proved to be invariably successful.

5. Nonspecific therapeutic measures, both local and systemic, have occasionally proved of benefit but more often have resulted in failure.

6. Ionization, which is a comparatively new physical therapeutic agency, has produced striking and prolonged palliation of symptoms in a large number of cases of vasomotor rhinitis.

7. The technic of intranasal ionization has been simplified by a newly devised self-retaining electrode.

8. Ionization of the nasal passages can be carried out with any other desired method of therapeutic management of vasomotor rhinitis.

9. Intranasal ionization produces comparatively mild reactions for a short period, but is an absolutely safe procedure devoid of any risk or ill effects.

10. The simplicity of technic, the favorable results and the safety of intranasal ionization fully justify its wider clinical employment in the treatment of vasomotor rhinitis.

Studies of Phosphorus of Blood: III. Phosphorus Partition in Whole Blood and in Serum and Serum Calcium and Plasma Phosphatase During Healing of Late Rickets. Genevieve Stearns, and Edna Warweg.

Am. J. Dis. Chil. 49:79 (Jan.) 1935.

Stearns and Warweg observed the serum calcium, the plasma phosphatase and the phosphorus partition in the whole blood and in the serum during the healing of late rickets in two children and over a period of three years in a child whose rickets had healed without a corresponding rise in the level of inorganic phosphorus of the serum. In active late rickets, the organic acid-soluble or ester fraction of phosphorus is definitely low and rises rapidly on addition of vitamin D to the diet. The rise in the ester phosphorus of the corpuscles was observed before the rise in the inorganic phosphorus of the serum occurred. If the amount of vitamin D given is insufficient for rapid healing, the increased level of ester phosphorus may not be maintained. The readily hydrolyzable (ten minute) fraction of the ester phosphorus was not significantly altered from the normal in one patient during the period of active rickets. The level of plasma phosphatase was increased in the blood of both children with active rickets. The values tended to decrease as healing progressed but was still far above normal when roentgenologic healing was complete. In one patient the plasma phosphatase was still double the normal value a year after healing was complete. Roentgenologic evidence of healing was observed in one child before any rise in the level of inorganic phosphorus occurred. The ester phosphorus at this time was still below the normal level but well above the level noted at the first observation. — (Abst. J. A. M. A. 104:947 (March 16) 1935.

Treatment of Inflammatory Diseases of the Female Genitals. (Behandlung entzündlicher Erkrankungen der weiblichen Fortpflanzungsorgane.) P. Werner.

Wien. klin. Wchnschr. 47:1426 (Nov.) 1934.

In acute inflammations the patients are kept in bed, an ice bag is applied, attention is paid to the bowels, local measures of treatment are avoided. When fever abates there is full scope for local therapy, such as vaginal douches, hip baths and the like.

Diathermy is the most effective means to cause resorption of inflammatory products, though great precaution is necessary in the beginning. One should apply diathermy externally by placing one electrode over the sacral region, and the other above the symphysis. The current intensity has to be low with short exposures (5-10 minutes). The treatment may be given on alternate days with the temperature of the body being controlled. Any rise in temperature dictates interruption of the treatment for a few days. Internal diathermy (one electrode in the vagina or the rectum, the other to be wound around the body like a belt) should only be attempted when the patient has been free from fever for some weeks. We then might use more intensive currents without any risk of recurrence.

Short wave irradiation has been recently attempted many times in gynecological cases but did not prove superior to diathermy nor even of equal value.

The Fibrinogen Level of the Blood as Influenced by X-Ray Exposure. (Der Fibrinogenspiegel des Blutes unter dem Einfluss von Röntgenbestrahlung und die primäre Strahlenwirkung). A. Held, and H. Hülbach.

Strahlentherap. 51:664, 1934.

Total irradiation and spleen treatment of dogs and rabbits by varying x-ray doses leads to the following conclusions: The hemostatic effect of x-rays is partly due to the fibrinogen increase. The regular two-phasic reaction caused by total body exposure consists of a transient decrease and a prolonged increase of the fibrinogen level. The first phase is a direct effect of the radiation, as was shown by isolated irradiation of the spleen. The second phase is caused indirectly by irradiation products affecting the reticulo-endothelium which produces the fibrinogen.

Sieve-radiation. (Siebstrahlung.) W. Haring.

Strahlentherap. 51:154, 1934.

Sieve-radiation is obtained by sending x-rays through a lead sieve with holes of 3 mm. diameter and 500 per cent transmission. The exposed parts of the skin tolerate a dose three times as strong as the toleration dose with a continuous field. The x-ray pencils do not fuse down to 10 cm. depth of tissue. The therapeutic effects obtained so far are promising.

Reaction of the Leucocytes In Mikulicz Disease by Short Wave Treatment. (Ueber das Verhalten des Leukozyten- und sonstigen Blutbildes bei einem Fall von Mikulicz-Erkrankung nach Kurzwellenbehandlung.) Paul Groag.

Wien. klin. Wchnschr. 47:1165 (Sept.) 1934.

A case of Mikulicz disease with atypic leukemic lymphomatosis and aleukemic blood findings, was given short wave irradiation to the diseased salivary glands, with decided improvement of the blood conditions, although the swellings did not disappear. Subsequent to short wave treatment two x-ray applications to the salivary glands were made, which resulted in the same influence on the blood conditions and disappearance of the glandular enlargements. Short wave irradiation applied to the salivary glands of a healthy girl for control did not reveal any identical alterations of the blood picture as it did in the case of Mikulicz disease. Further investigations will have to prove if in other types of leukemic lymphomatosis short wave irradiation will be of benefit.

Is Ultraviolet Irradiation Prophylactic In Tuberculous Children. (Vermögen Ultraviolettlichtbestrahlungen Erkrankungen tuberkulose gefährdeter und tuberkuloseinfizierter Kinder zu verhüten?) Ernest Brunthaler.

Deutsche med. Wchnschr. 60:863 (June) 1934.

In a city of about 65,000 inhabitants for a period of 10 years attempts were made with irradiation by artificial alpine lamps. They have proven a most efficacious agent in raising resistance and in preventing illness in children who were endangered by tuberculosis.

Artificial alpine sun treatment is valuable for such children on account of its high efficiency, it is not risky, and is easily administered. Harmlessness is assured only by a previous careful examination, if possible by x-rays, to establish the absence of tuberculous foci. Tuberculous foci present a contraindication to artificial alpine sun irradiation. Unless there is a special indication to send a patient to a health resort, artificial mountain sun is by no means proven inferior to sanatorium treatment.

Biophysics of Ultrashort Wave Therapy. (Physikalisch-biologische Zusammenhänge bei der Ultra-Kurzwellenbehandlung.) E. P. Habicht.

Strahlentherap. 51:532, 1934.

A simple calculation reveals that besides electromagnetic resonance a mechanical resonance of biological structures to ultrashort waves must be expected. The mechanical resonance of the red blood corpuscles with a diameter of 7.5μ corresponds — as far as frequency is concerned — to an electromagnetic wave of a wavelength somewhat shorter than 4 m. This fact agrees with the observation that the selective effects of ultrashort waves manifest themselves in the range of less than 6 m.

Therapy With Ultra Short Waves. (Therapie mit Ultrakurzwellen.) E. Schliephake. Kinderärztl. Praxis 5:153 (April) 1934.

Direct deep effect is the principal characteristic. With the exception of deep therapy, no pronounced deep effect was obtainable by any other procedure than with the ultra short waves. In the beginning people expected a similar deep effect from diathermy currents, yet actually it does not exist. Moreover the diathermy currents are flowing into the body in accordance to Ohm's law. That particular effect of the short wave field is due to and explained by the fact that no electric current is being supplied to the body. By striking directly the particles of the substance, the field takes effect in producing electric currents at and inside of it, which in the end may be transformed into heat. Accordingly another important feature of the ultra short wave is evidenced viz., the selective effect on different substances.

There are some other characteristics of the short wave field which we cannot explain by the mere production of heat. The author believes that some peculiar effects upon the colloid structure are involved. Schliephake, in cooperation with Compère, was able to demonstrate a change in the surface tension of certain colloid mixtures and solutions in the short wave field, though heating plays no rôle in it. In such a way it is possible to produce osmotic forces of unusual strength in the body. Considering the value of the colloid and osmotic procedures in the body, it is obvious that in short waves we have an important method. Constant and low frequency currents are acting merely upon the surface of the body while short wave effect may reach into the inward structure of the cells. In the bactericidal properties of the ultra short waves, we see an effect on the minutest structural element.

The value of the new procedure was proven on patients with furunculosis. There proved to be no necessity for an incision. By short waves also massive suppurations can be healed, such as empyema of the pleural cavity and pulmonary abscesses. All patients with pleural empyema, pulmonary abscess, chronic and suppurating pneumonia entirely recovered within 8-9 weeks.

Osteomyelitis, too, offers a favorable field for short wave treatment. The sooner the treatment is started the better.

Another use of short waves in practice is presented in the production of pyrothermy or electropyrexia. The patients feel but a slight sense of heat at the skin, yet the temperature may easily be raised to 38-39 degrees C., on certain occasions even to 40-41 degrees. It was very natural, therefore, to treat also progressive paralysis by pyrothermy. Over 500 patients with paralysis are reported to have been treated by pyrothermy. The curative results are said to be as good as in therapeutic malaria fever, but with a lower mortality rate.

A Standardized Exercise Tolerance Test for Patients with Angina Pectoris on Exertion. Joseph E. D. Riseman, and Beatrice Stern.

Am. J. M. Sc. 188:46 (Nov.) 1934.

The authors have used a two-step staircase similar to that described by Master and Oppenheimer. The exercise of walking up and down stairs is familiar to the patient and needs no training. The amount of exercise can be varied readily. When the patient develops an attack of angina, he can rest safely in the very room in which the exercise is performed. Being portable, the staircase can be moved readily to a room with regulated temperature. The number of foot pounds of work performed may be estimated roughly by multiplying the patient's weight by the height of the staircase (1½ feet) and the number of trips performed. This is inexact, however, for it ignores the work done in descent of the staircase.

A group of 57 consecutive patients with a clinical diagnosis of angina pectoris was studied. The exercise performed under the standard conditions of the test induced attacks in 34 patients. These attacks were precisely like those experienced in daily life. When the standardized test was repeated, even months later, the same amount of exercise again precipitated an attack in the same individual. Nineteen patients did not develop an attack under the standardized conditions. The diagnosis of angina pectoris eventually proved to be exceedingly doubtful in all but one of these patients. The test affords a means of investigating angina pectoris and is of distinct value as an aid in diagnosing doubtful cases and in evaluating both the condition of the patient and the results of therapy.

Urologic Surgery. Albert J. Scholl, et al.

Arch. Surg. 29:316 (Aug.) 1934.

A series of experiments was carried out which indicated that the optimal density of the radio frequency current for adequate under-water cutting was 300 volts and 0.7 amperes. It was discovered that the death of cells occurred for an appreciable distance beyond the actual cut if the density of the current was increased to 325 volts and 1.8 amperes. Healing subsequent to cuts made with such a current proceeded along the cut edge without the death of an appreciable amount of tissue beyond the point of contact with the advancing loop. These investigators further discovered that a coagulating current of low wattage, when held in contact with the surface of the prostatic urethra for a length of time sufficient to whiten the tissues, caused death of cells to great depths. The depth of the subsequent slough bears a direct relation to the length of time the active electrode is in contact with the tissues.